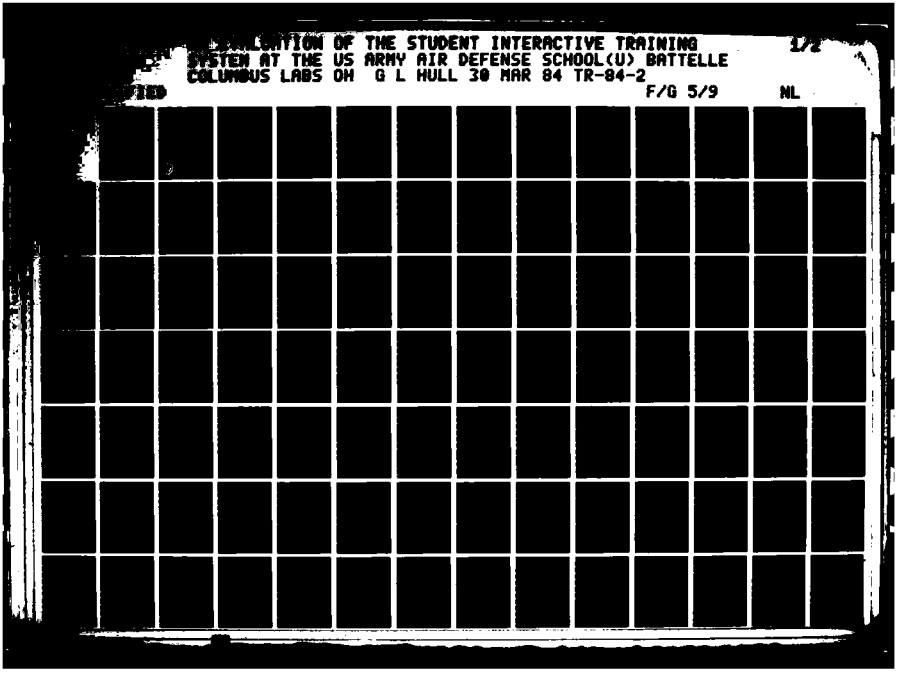
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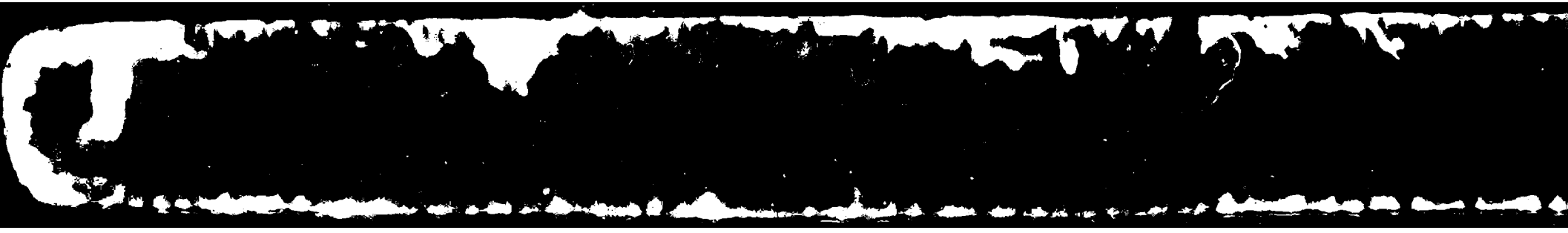

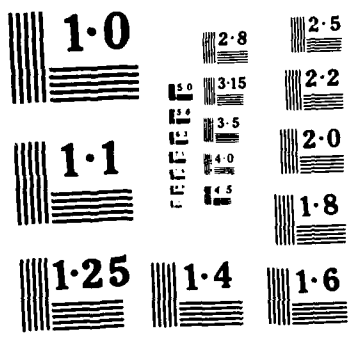


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# AN EVALUATION OF THE STUDENT INTERACTIVE TRAINING SYSTEM AT THE US ARMY AIR DEFENSE SCHOOL

FINAL REPORT

DEVELOPED BY:

GARY L. HULL, Ph.D.

30 MARCH 1984

APPROVED FOR PUBLIC RELEASE

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PREPARED FOR:

US ARMY COMMUNICATIVE TECHNOLOGY OFFICE
FORT EUSTIS, VIRGINIA

US ARMY AIR DEFENSE ARTILLERY SCHOOL
FORT BLISS, TEXAS

## NOTICES

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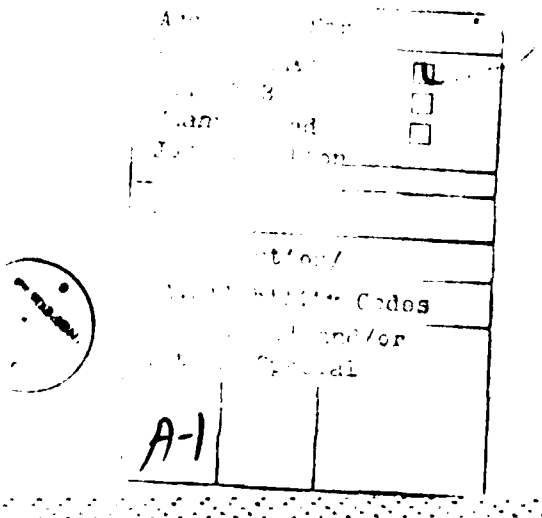

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| REPORT DOCUMENTATION PAGE | | READ INSTRUCTIONS BEFORE COMPLETING FORM |
|---|---|---|
| 1. REPORT NUMBER<br>TR-84-2 | 2. GOVT ACCESSION NO.<br>AD-A157 974 | 3. RECIPIENT'S CATALOG NUMBER |
| 4. TITLE (and Subtitle)<br>AN EVALUATION OF THE STUDENT INTERACTIVE TRAINING SYSTEM AT THE US ARMY AIR DEFENSE SCHOOL | | 5. TYPE OF REPORT & PERIOD COVERED<br>FINAL EVALUATION REPORT |
| | | 6. PERFORMING ORG. REPORT NUMBER<br>TR-84-2 |
| 7. AUTHOR(s)<br>GARY L. HULL, PH.D. | | 8. CONTRACT OR GRANT NUMBER(s)<br>BATTELLE COLUMBUS LABS<br>DELIVERY ORDER NO. 0651 |
| 9. PERFORMING ORGANIZATION NAME AND ADDRESS<br>BATTELLE MEMORIAL INSTITUTE COLUMBUS LABORATORIES<br>500 KING AVENUE<br>COLUMBUS, OHIO 43201 | | 10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS<br>SCIENTIFIC SERVICES PROGRAM |
| 11. CONTROLLING OFFICE NAME AND ADDRESS<br>CHIEF, ARMY COMMUNICATIVE TECHNOLOGY OFFICE<br>ATTN: AMSEL-PED<br>FORT EUSTIS, VA 23604-0337 | | 12. REPORT DATE<br>30 MAR 84<br>13. NUMBER OF PAGES<br>158 |
| 14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)<br>COMMANDER<br>US ARMY AIR DEFENSE ARTILLERY SCHOOL<br>ATTN: ATSA-DTN-AT<br>FORT BLISS, TX 79916-7090 | | 15. SECURITY CLASS. (of this report)<br>UNCLASSIFIED<br>15a. DECLASSIFICATION/DOWNGRADING SCHEDULE |

16. DISTRIBUTION STATEMENT (of this Report)

APPROVED FOR PUBLIC RELEASE. DISTRIBUTION UNLIMITED.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

MOS 16H10, AN/TSQ-73, COMMAND/CONTROL SYSTEM, $C^2$, MOS 25L10, CBI, SITS, COMPUTER BASED INSTRUCTION, STUDENT INTERACTIVE TRAINING SYSTEM, TRAINING, TRAINING EFFECTIVENESS, ONE STATION UNIT TRAINING, OSUT, INTERACTIVE VIDEOTAPE, INTERACTIVE VIDEODISC

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

THIS IS THE FINAL REPORT ON A PROJECT TO OPERATIONALLY TEST AND EVALUATE A TRAINING DELIVERY SYSTEM THAT EMPLOYS A STUDENT INTERACTIVE MICROCOMPUTER VIDEO TAPE METHODOLOGY. THE SYSTEM, KNOWN AS THE STUDENT INTERACTIVE TRAINING SYSTEM (SITS) WAS DEVELOPED TO DELIVER COMPUTER BASED INSTRUCTION (CBI) COURSEWARE, WITH TWO DIMENSIONAL (2D) SIMULATION TO MOS 16H10 ONE STATION UNIT TRAINING (OSUT) STUDENTS ON AN/TSQ-73 CONSOLE OPERATION. THE PRIMARY OBJECTIVE OF THIS CBI SYSTEM WAS TO REDUCE THE REQUIREMENT FOR TRAINING ON HIGH DOLLAR, TACTICAL

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END ITEMS OF EQUIPMENT. THE PROJECT WAS IMPLEMENTED UNDER THE AUSPICES OF US ARMY AIR DEFENSE ARTILLERY SCHOOL (USAADASCH) FORT BLISS, TEXAS AND THE ARMY COMMUNICATIVE TECHNOLOGY OFFICE, FORT EUSTIS, VIRGINIA.

THE SITS PROVED TO BE A HIGHLY EFFECTIVE INSTRUCTIONAL SYSTEM. A NUMBER OF "EFFECTIVENESS" MEASURES, INCLUDING WRITTEN TESTS, PERFORMANCE TESTS, TIME AND ATTITUDES INDICATED A SIGNIFICANTLY HIGHER LEVEL OF EFFECTIVENESS FOR STUDENTS USING THE SITS. OTHER MEASUREMENTS INDICATED THAT SITS' STUDENTS SCORED AT LEAST AS WELL AS THE CONTROL STUDENTS. THE LERNER'S COGNITIVE STYLE DID NOT APPEAR TO HAVE AN INTERACTION EFFECT WITH THE TYPE OF TREATMENT THAT WAS RECEIVED.

STUDENT ATTITUDE TOWARD THE SITS WAS POSITIVE. FINDINGS FROM THE EVALUATION SUGGEST THAT STUDENTS WILLINGLY RECEIVED INSTRUCTION FROM THE SITS.

INSTRUCTORS ALSO INDICATED A HIGH LEVEL OF ACCEPTANCE FOR THE SITS. ALL INSTRUCTORS WERE WILLING TO WORK WITH THE SITS IN THE FUTURE.

PROGRAM IMPLEMENTATION APPEARS TO HAVE BEEN CARRIED OUT IN A REASONABLY SUCCESSFUL MANNER. THEREFORE, PROGRAM IMPLEMENTATION SHOULD NOT HAVE BEEN AN INTERVENING VARIABLE IN THE EVALUATION STUDY.

THE GENERAL RELIABILITY OF THE SITS' HARDWARE AND SOFTWARE PROVED TO BE GOOD. ANY NEGATIVE ASPECTS ABOUT THE SYSTEM TEND TO CENTER AROUND THE QUALITY OF THE VIDEOTAPES.

THE COST ANALYSIS INDICATED THAT THE SITS WAS AN ECONOMICALLY EFFECTIVE ALTERNATIVE TO THE CURRENT METHODOLOGY.

# AN EVALUATION OF THE STUDENT INTERACTIVE TRAINING SYSTEM AT THE US ARMY AIR DEFENSE SCHOOL

FINAL REPORT

By: Gary L. Hull, Ph.D.

March 30, 1984

Prepared for:

US Army Training and Doctring Command

Fort Monroe, VA 23651

# EXECUTIVE SUMMARY

## INTRODUCTION:

This is the final report on a project to operationally test and evaluate a training delivery system that employs a student interactive microcomputer/ video tape methodology. The system, known as the Student Interactive Training System (SITS) was developed to deliver Computer Based Instruction (CBI) courseware, with Two Dimensional (2D) Simulation to MOS 16H10 One Station Unit Training (OSUT) students on AN/TSQ-73 Console Operation. The primary objective of this CBI System was to reduce the requirement for training on high dollar, tactical end items of equipment. The project was implemented under the auspices of the U.S. Army Air Defense Artillery School (USAADASCH) Fort Bliss, Texas, the Training Development Institute (TDI), Fort Monroe, Virginia and the Army Communicative Technology Office, Fort Eustis, Virginia.

## PURPOSE OF EVALUATION:

The evaluation concentrated on documenting outcomes and, to some extent, activities in several basic areas of inquiry. The original evaluation request specifically sought to examine the following questions as they related to the SITS:

1. Will students using the SITS be able to obtain a statistically comparative performance rating as those using current methods?

2. Will students using the SITS be able to obtain a comparative skills performance with reduced end item equipment exposure?

3. Will students using the SITS be able to complete training in a time statistically comparative to those learning by current methods?

4. Will students using the SITS indicate an acceptance/non-acceptance of the training methodology?

5. Will instructors/course managers of the SITS indicate an acceptance/non-acceptance of the training methodology?

6. What will be the comparison of students confidence with acquired skills of those trained on the SITS and those trained by current methods?

## EVALUATION DESIGN:

The evaluation plan was designed to retain simplicity and clarity of procedures in implementation, data collection, and analyses, so that the evaluation might be conducted with a minimum of disturbance of routines of the AN/TSQ-73 course. The evaluation incorporated a posttest only control group design. Subjects were randomly assigned to the "experimental group" (receiving practical exercises through SITS and actual equipment) and the "control group" (receiving practical exercises on actual equipment only; current system).

The paradigm for the evaluation basically consisted of two independent variables and four dependent variables. The first independent variable was the training method. A second independent variable included the students' learning style. The student learning style variable was measured by a "Group Embedded Figures Test." Students' scores on a written test and a performance test, speed of skill acquisition and student acceptance/non-acceptance of the system served as the dependent variables.

Another part of the evaluation consisted of subjective comparisons (by students, instructors and staff in the class using the experimental SITS) of effectiveness and four other variables including: student acceptance, instructor acceptance, program implementation and reliability. Cost analysis variables were also examined in this evaluation.

The experimental and the control groups received the same instructional treatments on the AN/TSQ-73 with the exception of the practical exercise component. The experimental group received this component through a combination of SITS and actual equipment lessons, while the control group received instruction through hands-on laboratory activities using actual equipment.

POPULATION:

The population from which the sample was derived can be defined as MOS 16H10 OSUT students assigned to AN/TSQ-73 System Console Operation course. The sample was selected from six different classes that completed the course during a five month period. Classes were scheduled to start approximately every two weeks. All students from the six classes were determine to be either "field dependent" or "field independent" learners. These two groups were then randomly assigned to one of the four following treatment groups.

1. Experimental/Field Dependent.
2. Experimental/Field Independent.
3. Control/Field Dependent.
4. Control/Field Independent.

DATA ANALYSIS:

A statistical comparison was made of scores on the written and performance tests for the experimental and control groups. Also, a statistical comparison was made between the amount of time the experimental group and control group took to complete both the practical exercises and the course. A further statistical comparison was made to determine if the students' "cognitive style" influenced these dependent variables. Analysis of variance techniques were used to determine the significance of any difference that might have existed. Analysis of variance techniques are among the most popular statistical procedures for analyzing data from evaluation designs with two or more variables. These procedures provided an excellent vehicle for assessing any main effects and interaction effects that might have existed among the evaluation variables.

FINDINGS AND CONCLUSIONS:

1. The SITS proved to be a highly effective instructional system. A number of "effectiveness" measures, including written tests, performance tests, time and attitudes indicated a significantly higher level of effectiveness for students using the SITS. Other measurements indicated that SITS's students scored at least as well as the control students. The learner's cognitive style did not appear to have an interaction effect with the type of treatment that was received.

2. Student attitude toward the SITS was positive. Findings from the evaluation suggest that students willingly received instruction from the SITS.

3. Instructors also indicated a high level of acceptance for the SITS. All instructors were willing to work with the SITS in the future.

4. Program Implementation appears to have been carried out in a reasonably successful manner. Therefore, program implementation should not have been an intervening variable in the evaluation study.

5. The general reliability of the SITS's hardware and software proved to be good. Any negative aspects about the system tend to center around the quality of the videotapes.

6. The cost analysis indicated that the SITS was an economically effective alternative to the current methodology.

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## INTRODUCTION

This is the final report on a project to operationally test and evaluate a training delivery system that employs a student interactive microcomputer/ video tape methodology. The system, known as the Student Interactive Training System (SITS) was developed to deliver Computer Based Instruction (CBI) courseware, with Two Dimensional (2D) Simulation to MOS 16H10 One Station Unit Training (OSUT) students on AN/TSQ-73 Console Operation. The primary objective of this CBI System was to reduce the requirement for training on high dollar, tactical end items of equipment. The project was implemented under the auspices of the U.S. Army Air Defense Artillery School (USAADASCH) Fort Bliss, Texas, the Training Development Institute (TDI), Fort Monroe, Virginia and the Army Communicative Technology Office, Fort Eustis, Virginia.

## BACKGROUND

The AN/TSQ-73 System is considered to be the state of the art in air defense command and control systems. It includes many technological advancements which were not part of earlier generations. The application of medium-scale integrated circuitry has provided further reliability increases comparable to those attained by use of integrated circuits in place of discrete components. The application of the state-of-the-art circuiting advancement has permitted added capability and capacity to be packaged in even smaller, still more reliable units. The AN/TSQ-73 System is organized on the basis of four functional subsystems of equipment: display, radar interface, automatic data processing, and communications. The widespread use of micro-electronic digital circuiting to replace discrete component digital and a number of analogy elements has resulted in size, weight, and power reductions that enables the entire system to be housed in a single, highly mobile shelter.

The AN/TSQ-73 System Command/Control Console Operation Training Course, for MOS 16H10 students, that was being employed can best be described as an individually paced methodology. All materials are under the control of the students as to how quickly they move toward completion. The following media-mix are utilized in the course:

1. CAI - 23 hours (estimated time required for completion);
2. Sync-Tape/Slides - 23 hours (estimated time required for completion);
3. Practical Exercises - 30 hours (estimated time required for completion);
4. Programmed Text - 30 hours (estimated time required for completion);
5. Written Examinations - 11 hours (estimated time required for completion);
6. Practical Exam - 3 hours (estimated time required for completion);

The existing course, which was operationally tested and evaluated during 1982, had by-and-large been determined to be an effective program. Any criticism that the course received generally related to the Practical Exercise components. These criticisms centered on the lack of practical exercise equipment for student use. Three AN/TSQ-73 systems were assigned to the course for training purposes. This number proved to be insufficient, resulting in students being assigned to groups of three to four persons for

all practical exercises. Students, in this type of grouping, would often be an observer while a peer performed the practical exercise. In addition, students often had to wait for a period of time before equipment was available for their use. The probability of increasing the number of AN/TSQ-73 Systems for training purposes was determined to be low, since the system was an extremely high cost item.

A decision was made to explore different training methodologies, which could reduce the actual amount of time that a student would need on the AN/TSQ-73 System while in the practical exercises. The methodology that was determined to be most feasible, for alleviating the problem, was an interactive video system. Interactive video could simulate the practical exercises that had, in the past, been provided on the actual equipment. Progress in electronic and telecommunications technology has led to recent development of interactive video delivery systems which appear to offer a highly flexible, relatively low cost alternative to high cost "hands-on" training. The intent of the new methodology was to supplement the existing methodology, not to replace it. In other words, students would still have "hands-on" experience with the actual equipment; however, the time required on the actual equipment was expected to be reduced.

SITS:

The word interactive implies something other than passive experience. At a minimal level, interactivity would connote the ability of the user to control the way in which a presentation is viewed, with a corresponding response by the delivery system. The user, in effect, is given the power to alter or change the way in which information may be presented. Interaction by the user may take place as a result of a user decision; discrete instruction from the instructor; or instructions from some auxiliary source material. The basic form of the interaction may be expressed through touch panels, keyboards, light pens and voice activation. The entire process is characterized by both accuracy and overall speed of response of the delivery mechanism.

As the term interactive video is used, it is important to understand that interactive video can also include natural audio as well as video in a fully interactive sense. The real goal has been to develop a man/machine interaction that is transparent. The user should not even sense that they are "talking" to a machine.

The general public's perception seems to include any system that has a video-based delivery system accompanied by some level of microprocessor support. The primary thrust of the interaction video movement has been to find more effective ways to visualize concepts and procedures and yet at the same time preserve the beneficial aspects of computer assisted instruction. For many developers the video component of the system has become a video ROM callable and useable from an external program. The overall goal, irrespective of the delivery mechanism chosen, is still usually of naturalness for the user.

The SITS, developed at Fort Bliss, is based on the principles that have just been discussed. Each SITS includes the following items:

1. One Apple II+ Microcomputer;
2. Two disc drives;
3. One videotape player;
4. Two color video monitors;
5. An expansion chassis;
6. Two touch-responsive bezels;
7. Associated controller and interface card;
8. Cabinet and table (to house the above items).

Student interaction with SITS can be provided by the keyboard on the touch panel on either monitor. One monitor of the system is normally used to display CAI material, while the second monitor provides displays from the videotape player. This method allows the student to simulate the actual equipment by visual selection and touching of specific controls in sequence as they are displayed on the screen.

The SITS with touch panel control has the potential to be a versatile and relatively inexpensive system which combines computer assisted instruction with video display. Using the touch panels of the system, the student interacts with the CAI text material and the video display to perform many of the same functions that they would if they were functioning on the actual AN/TSQ-73 System.

The exercise portion of the course, in which SITS is being employed, serves primarily to provide students opportunities for appropriate practice. Introducing SITS to the practical exercises, also introduces another consideration. That consideration becomes a question that might be stated as follows: "Can practical exercises, to some degree, be simulated through the application of SITS?"

COURSEWARE DEVELOPMENT:

The courseware developers had four guiding principles in mind as they approached the development process. These guiding principles were as follows:

1. First, they considered it important to carefully design the courseware so that the student would learn the material. Specifically, they were interested in designing lessons that would enhance the students' capabilities to perform the designated tasks. This required the matching of job performance measures with the content to be include in the SITS lessons.

2. Second, the developer worked with the idea that students' time is valuable. They approached the task with the belief that effective courseware should permit the more able student to progress rapidly but also provides the necessary help to those who need it.

3. Third, that the presentation of materials should simulate the actual environment as close as possible. In addition, student responses needed to closely resemble the type of

response that would be required of a person when interacting with the actual equipment.

4. Fourth, courseware validation and modification should be included in the development process. This included the idea that the courseware should be validated before being presented to the students in a training situation.

The developmental team followed these principles closely throughout the development process. The eventual product of this effort was the development of seventeen SITS Lessons. At the time of the evaluation, however, the lessons were yet considered to be prototype materials. The video portions of the lessons, developed by in-house personnel using low-tech equipment, were not of professional quality. Student completion times for these lessons were estimated to range from 25 minutes to 90 minutes.

A decision was made, in May 1983, to evaluate the SITS lessons to determine their effectiveness. It was decided that the SITS lessons had been put through enough developmental rigor. This decision also included the provision that the evaluation would be conducted by an outside evaluator. The first task for the evaluator was to review the intended evaluation purposes and to develop an evaluation plan that would serve these purposes. The next section of this report will discuss the purposes of the evaluation.

## PURPOSE OF THE EVALUATION

The failure of many efforts to evaluate training programs often stems from a lack of understanding of the programs themselves. A training program can be viewed as a set of hierarchically arranged instructional experiences that interrelate to generate several well-defined terminal outcomes. The purpose of the evaluation is to revise, delete, modify, add to, or confirm the efficacy of these experiences.

When viewed from this perspective, the key to understanding how and why a training program brings about the outcomes it does lies in that program's hierarchical structure, or the way in which its components build upon one another to achieve outcomes greater than those that can be expected from any single part. When evaluators fail to base their evaluation designs on a thorough understanding of the purpose and organization of the training, their results and conclusions seldom address the needs that prompted the evaluation. Moreover, since their results and conclusions fail to represent existing conceptions of the program, they cannot provide direction for program revision or modification.

The evaluation concentrated on documenting outcomes and, to some extent, activities in several basic areas of inquiry. The original evaluation request specifically sought to examine the following questions as they related to the SITS:

1. Will students using the SITS be able to obtain a statistically comparative performance rating as those using current methods?

2. Will students using the SITS be able to obtain a comparative skills performance with reduced end item equipment exposure?

3. Will students using the SITS be able to complete training in a time statistically comparative to those learning by current methods?

4. Will students using the SITS indicate an acceptance/non-acceptance of the training methodology?

5. Will instructors/course managers of the SITS indicate an acceptance/non-acceptance of the training methodology?

6. What will be the comparison of students confidence with acquired skills of those trained on the SITS and those trained by current methods?

It is common to judge the quality of an instructional program by its effects. This places emphasis on a demonstration of results rather than just an indication of potential. It was expected that such results would be evident among students as the group most affected by an instructional program. But instructors, too, bear the impact of curricular innovation through changes in their duties and responsibilities. These two groups, students and instructors, were the sources of data collection for the SITS.

From students, data were sought on achievement (effectiveness) and their attitudes toward the instructional system. Instructors participating in the experimental program were asked to provide data on their reactions to and their judgments of the SITS lessons. These data reflected the basic questions about student performance and instructor/student acceptance addressed in the statement of work.

Program implementation cannot be overlooked in any evaluation plan. An adequate summative evaluation requires that some attention be given to the quality of implementation of the courseware. Unless the implementation is carried out in accordance with project plans, and is of high quality, conclusions cannot be made about the impact of the courseware. Therefore, the evaluation placed some emphasis upon program implementation.

The reliability of the instructional system is important to the overall evaluation plan. The reliability issue was addressed with the question, "Are students able to consistently progress through the lessons without help from the program facilitators?" Another question concerning reliability focused upon the issue of "How often is downtime of the system a factor?"

The purpose of instructional cost-effectiveness analysis is to provide the decision-maker with data on the cost and probable effectiveness for the alternatives, among which he must choose one course of action. It should be pointed out that cost-effectiveness analysis involves clarifying the relationships between these two factors (cost and effectiveness) so that the decision-makers can make reasonably sound choices among the various ways an objective might be met. The evaluation plan for this instructional system examined several important variables related to cost-analysis of SITS and the currently used instructional program.

In summary, data were collected from six types of questions that were formulated from the following variables:

1. Effectiveness of the instructional system.

2. Student acceptance of the instructional system.

3. Instructor acceptance of the instructional system.

4. Program implementation of the instructional system.

5. Reliability of the instructional system.

6. Cost analysis of the instructional system.

The next section of this report details the evaluation design that was used for evaluating the SITS. The evaluation design was developed incooperation with personnel at the USAADASCH. The design attempted to isolate any major constraints (intervening variable) that would effect the evaluation outcome.

## EVALUATION DESIGN

Designers of interactive video instruction are generally concerned with systems that guarantee active participation in learning. They are rarely content to tolerate the traditional passive delivery systems of the past. This mindset is generally based on the assumption that the learner will either learn more effectively in this mode or upon the assumption that the learning experience can be made more enjoyable with a corresponding increase in motivation to learn. No large body of research data exists to support the premise that interactivity is any guarantee for learning. However, there is an increasing body of literature and pertinent research that would seem to indicate that if students have an opportunity for appropriate practice and if they enjoy the learning experience, they may be motivated to do more. This is especially true of adult learners.

There seems to be a widespread concern over the effectiveness of these so-called new learning systems. Evaluation data are needed to show demonstrable improvement in actual job performance as well as increases in paper and pencil tests of learning. Additional data are still needed to assess the effects of the delivery system and materials on the learner's overall acceptance of the learning process. More data and empirical models are needed to make sound media decisions based upon the various characteristics of the learners. The results of this evaluation will contribute toward these needs.

It should be expressed that this is a curriculum evaluation as well as an evaluation of any specific delivery system . The alternative curriculums happen to differ on at least two dimensions, their strategy for teaching and their mode of instruction. But the student learning that takes place within a course should satisfy the same minimal criteria. Comparisons of the course with similar delivery mechanisms or contrasts across different instructional strategies for courseware would most certainly be helpful in selecting among such alternatives. Still, a potential consumer might view such studies as limited in their value if none of the alternatives matched or exceeded the results obtained through traditional, proven practices. Thus, this evaluation concentrated on documenting the course's effects relative to the outcomes of the existing methodology.

The evaluation plan was designed to retain simplicity and clarity of procedures in implementation, data collection, and analyses, so that the evaluation might be conducted with a minimum of disturbance of routines of the AN/TSQ-73 course. The evaluation incorporated a posttest only control group design. Subjects were randomly assigned to the "experimental group" (receiving practical exercises through SITS and actual equipment) and the "control group" (receiving practical exercises on actual equipment only; current system).

The paradigm for the evaluation basically consisted of two independent variables and four dependent variables. The first independent variable was the training method. A second independent variable included the students' learning style. The student learning style variable was measured by a "Group Embedded Figures Test."* Students' scores on a written test and a performance test, speed of skill acquisition and student acceptance/non-acceptance of the system served as the dependent variables.

The experimental and the control groups received the same instructional treatments in the AN/TSQ-73 with the exception of the practical exercise component. The experimental group received this component through a combination of SITS and actual equipment lessons, while the control group received instruction through hands on laboratory activities using actual equipment. Figure 1 indicates the difference that existed between the treatments received by the experimental group and the control group.

Another part of the evaluation consisted of subjective comparisons (by students, instructors and staff in the class using the experimental SITS) of effectiveness and four other variables including: student acceptance, instructor acceptance, program implementation and reliability. Cost analysis variables were also examined in this evaluation. These six variables are now discussed in this report. In addition, a matrix is provided indicating the form of measurement and the data source used for each variable.

## Effectiveness

One of the major desired outcomes of any product evaluation is to determine that product's effectiveness. Perhaps the single most important criteria in judging a products success is its effect on student achievement. Educators tend to look at achievement results before other outcomes, and most new curricula comes with a promise to improve achievement in some manner. The goal of SITS curricula, however, was not necessarily to improve achievement. The main concern was to see if students, using SITS, could reduce the amount of time required on the actual equipment while in the practical exercises. In addition, the developers expected the students using the SITS to obtain an effectiveness rating that would be comparable, but not necessarily better than those students receiving their practical exercises entirely on the actual equipment.

*Herman Witkin, Group Embedded Figures Test, Consulting Psychologists Press, Palo Alto, California, 1971.

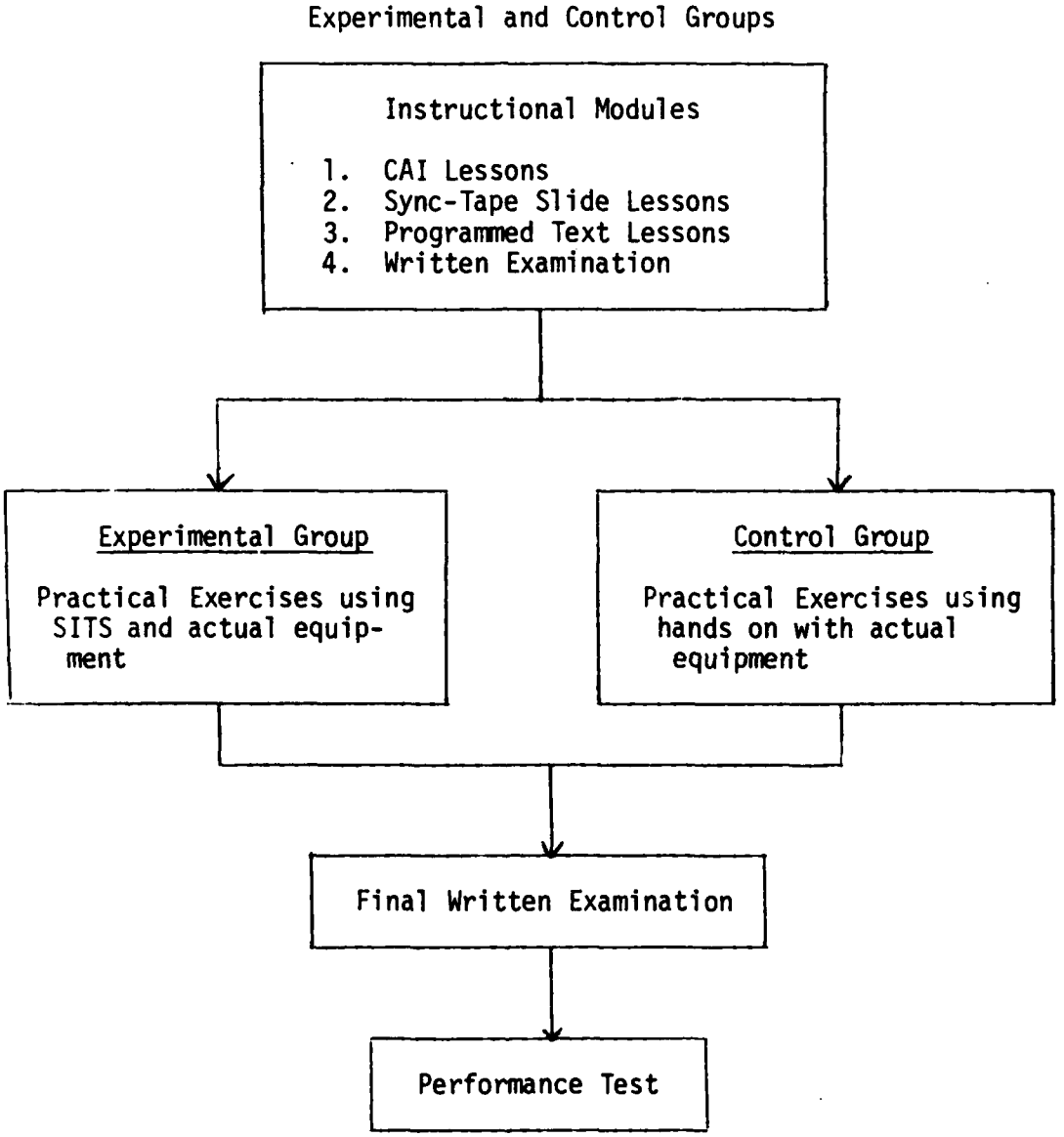



Figure 1: Comparison of Experimental and Control Treatments within AN/TSQ-73 Console Operation Course.

One part of the effectiveness question primarily focused on whether or not there was a significant difference in written test scores of students in the experimental group and the control group. Nine different written tests were used to collect data for this area of the evaluation. Eight of the tests are given to students throughout the course. The nineth test was administered as an end-of-course exam. In addition, the tests were examined for any indication of positive transfer of learning from the SITS to the other instructional components that were utilized in the course. These tests are discussed more fully in the "Instrumentation" section of this report.

Achievement and transfer of learning was also examined through the application of two practical examinations. The first practical exam was administered during the course, while the second one was an end-of-course practical exam.

The effectiveness variable was also examined by comparing the speed of acquisition of learning by the experimental group to the speed of the control group. Since the experimental and control groups were individually paced, average times for completion of the practical exercises and the total course was easily obtained for comparison.

Other factors used in judging the effectiveness variables included perceived speed of skill acquisition, perceived confidence in learning from SITS, perceived student attention, perceived student need and perceived transfer to task performance. In summary, the effectiveness variable was examined in the manner that is presented in Figure 2.

The following data sources were used in data collection for the effectiveness variable:

a. Written tests found at Appendix A.
b. Practical Examinations found at Appendix B.
c. Student Usage Log (Computer Managed Instruction Records).
d. Experimental Student End-Of-Course Questionaire found in Appendix C.
e. Control Student End-Of-Course Questionnaire found in Appendix D.
f. Instructor End-Of-Course Questionnaire found in Appendix E.

Each of the instruments, used in data collection for the effectiveness variable, is discussed later in this report under the section of instrumentation.

STUDENT ACCEPTANCE:

The task of measuring attitude is not a simple one. What's more, attempting to demonstrate differences between two or more groups, as some evaluations require, is probably the most difficult of all evaluation tasks.

To begin with, the concept of attitude, like many abstract concepts is a creation - a construct. As such, it is a tool that serves the human need to see order and consistency in what people say, think, and do, so

| Variables | Measurement | Data Source |
|---|---|---|
| 1.0 Cognitive Skill Achievement. | 1.1 Written Tests Scores. | 1.2 Course Records to be kept on each student. |
| 2.0 Transfer of Learning to Actual Performance. | 2.1 Practical Examinations Scores. | 2.2 Course Records to be kept on each student. |
| 3.0 Speed of Skill Acquisition of experimental group vs. control group. | 3.1 Number of hours required to complete the practical exercises for experimental and control groups.<br><br>3.1a Number of hours required to train students in experimental and control groups for the course. | 3.2 Course Records primarily from individual student logs. |
| 4.0 Perceived speed of Skill Acquisition via SITS. | 4.1 Subjective question on skill acquisition 5-Point Scale. | 4.2 Student End-Of-Course Evaluation; Instructor End-Of-Course Evaluation. |
| 5.0 Perceived confidence in learning in experimental and control treatment. | 5.1 Subjective question on confidence of learning, 5-Point Scale. | 5.2 Student End-Of-Course Evaluation. |
| 6.0 Perceived attention to learning in experimental and control treatment. | 6.1 Subjective question on attention to learning, 5-Point Scale. | 6.2 Student End-Of-Course Evaluation; Instructor End-Of-Course Evaluation. |
| 7.0 Perceived transfer of learning from the experimental and control groups to actual task performance. | 7.1 Subjective question on transfer of learning, 5-Point Scale. | 7.2 Student End-Of-Course Evaluation; Instructor End-Of-Course Evaluation. |
| 8.0 Learning Style of Students. | 8.1 Embedded Figures Test. | 8.2 Embedded Figures Test. |

Figure 2. Effectiveness Variable

that given certain behaviors, predictions can be made about future behaviors. An attitude or perception is not something we can examine and measure in the same way we can examine other variables. We can only infer that a person has a certain attitude by his/her words or actions. One of the basic ways to collect data concerning student attitude toward something is through the administration of questionnaires.

The student acceptance variable in this study was employed in an attempt to examine acceptance or non-acceptance on the part of the student user. The primary question was, "Would you choose the methodology used in this course if available to you in future courses?" Several questions, in various forms, were given to students in order to obtain information about the primary question. In summary, the student acceptance variable was examined in the following manner.

| Variable | Measurement | Data Source |
|---|---|---|
| 1.0 Attitude toward the overall course. | 1.1 Subjective question, 5-Point Scale. | 1.2 Student End-Of-Course Evaluation. |
| 2.0 Attitude toward the practical exercise component of the course. | 2.1 Subjective question, 5-Point Scale. | 2.2 Student End-Of-Course Evaluation. |
| 3.0 Willingness to take other similar courses involving SITS. | 3.1 Subjective question, 5-Point Scale. | 3.2 Student End-Of-Course Evaluation. |
| 4.0 Likes and dislikes about the SITS components of the course. | 4.1 Open-Ended question. | 4.2 Student End-Of-Course Evaluation. |

Figure 3. Student Acceptance Variable

The following sources were used in collecting data for the student acceptance variable:

a. Experimental Student End-Of-Course Questionnaire found in Appendix C.
b. Control Student End-Of-Course Questionnaire found in Appendix D.
c. Instructor End-Of-Course Questionnaire found in Appendix E.

These questionnaires are discussed later in this report under the area of instrumentation.

INSTRUCTOR ACCEPTANCE:

The instructor acceptance variable was employed in an attempt to examine acceptance or non-acceptance of the course on the part of the instructors. The primary question was, "Would you choose to participate with future courses using an instructional methodology similar to that used in this course?"

Several questions, in various forms, were given to instructors in order to obtain information about this primary question. These questions are similar to the student questions but naturally focused upon data collected from the course instructors and staff. In summary, the instructor acceptance variable included the following:

| Variable | Measurement | Data Source |
|---|---|---|
| 1.0 Attitude toward the overall course. | 1.1 Subjective question, 5-Point Scale. | 1.2 Instructor End-Of-Course Evaluation. |
| 2.0 Attitude toward SITS component of the course. | 2.1 Subjective question, 5-Point Scale. | 2.2 Instructor End-Of-Course Evaluation. |
| 3.0 Willingness to teach other courses using SITS. | 3.1 Subjective question, 5-Point Scale. | 3.2 Instructor End-Of-Course Evaluation. |
| 4.0 Likes and dislikes about the SITS components of the course. | 4.1 Open-ended question. | 4.2 Instructor End-Of-Course Evaluation. |

Figure 4. Instructor Acceptance

Data for the Instructor Acceptance Variable was obtained from the Instructor End-Of-Course Questionnaire (See Appendix E). The questionnaire will be discussed later in this report under the section of instrumentation.

PROGRAM IMPLEMENTATION:

Good instructional programs have often failed because of the manner in which they were implemented. At the same time, a successful implementation of a program can have a positive effect on the success or failure of a program. An evaluation should always try to assess the effect that program implementation had toward the overall efforts of the project.

The program implementation variables were used in an attempt to examine the question, "Did program implementation have any adverse affect on the overall effectiveness of the program?" This variable was examined through information obtained from several questions administered to both students and instructors. In summary, the program implementation variable was examined in the following manner:

| Variable | Measurement | Data Source |
|---|---|---|
| 1.0 Perceived Orientation to using SITS. | 1.1 Subjective question, 5-Point Scale. | 1.2 Student End-Of-Course Evaluation. |
| 2.0 Perceived quality of instructor assistance while using SITS. | 2.1 Subjective question, 5-Point Scale. | 2.2 Student End-Of-Course Evaluation. |
| 3.0 Perceived quality of the environment in which SITS was used. | 3.1 Subjective question, 5-Point Scale. | 3.2 Student End-Of-Course Evaluation. |
| 4.0 Perceived quality of SITS equipment operation. | 4.1 Subjective question, 5-Point Scale. | 4.2 Student End-Of-Course Evaluation. |
| 5.0 Perceived quality of SITS course material. | 5.1 Subjective question, 5-Point Scale. | 5.2 Student End-Of-Course Evaluation. |
| 6.0 Ability of students to work without instructor involvement. | 6.1 Subjective question, 5-Point Scale. | 6.2 Instructor End-Of-Course Evaluation. |

Figure 5. Program Implementation Variable

The sources used in data collection for the program implementation variable are as follows:

a. Experimental Student End-Of-Course Questionnaire found in Appendix C.
b. Control Student End-Of-Course Questionnaire found in Appendix D.
c. Instructor End-Of-Course Questionnaire found in Appendix E.

These questionnaires are discussed in this report under the section on instrumentation.

RELIABILITY:

The SITS hardware and software reliability factors were measured in both a quantitative and a subjective manner. Daily terminal downtime, percent of downtime, and cause or type of failure was recorded for each terminal. Analyses of failures over time was used to detect any trend. In summary, the reliability variable includes:

| Variable | Measurement | Data Source |
|---|---|---|
| 1.0 Daily terminal downtime. | 1.1 Amount of time from report of failure to repair. | 1.2 Problem Log for SITS Terminal. |
| 2.0 Cause or type of failure. | 2.1 Description of malfunction. | 2.2 Problem Log for SITS Terminal. |
| 3.0 Perceived reliability. | 3.1 Subjective question, 5-Point Scale. | 3.2 Student End-Of-Course Questionnaire; Instructor End-Of-Course Questionnaire. |

Figure 6. Reliability Variable

The following information sources were used in data collection for the reliability variable:

a. Experimental Student End-Of-Course Questionnaire found in Appendix C.
b. Control Student End-Of-Course Questionnaire found in Appendix D.
c. Instructor End-Of-Course Questionnaire found in Appendix E.
d. Problem Log for SITS Terminal found in Appendix F.

These data sources are discussed in this report under the section on instrumentation.

COST ANALYSIS:

This evaluation included a limited study of costs associated with the AN/TSQ-73 Console Operator course. These costs are related primarily to the SITS lessons that are used in the practical exercise component of the course. The SITS's cost factors are then compared to the cost factors that would be incurred in increasing the amount of actual equipment, in the existing course's practical exercise component. Cost factors associated with the SITS lessons were examined in the following areas:

1. Research and development of the courses.

2. Initial/acquisition of materials, equipment and supplies.

3. Operational costs.

4. Depreciation of equipment.

5. Estimated repair costs.

It was assumed that there would be a lifespan of ten years for the SITS hardware; and for projection purposes the same period of time would be estimated for the course software. As useful background information for the whole section on costs, the evaluation gathered whatever data are available regarding the acquisition and repair cost of all SITS equipment. Also, data were gathered to determine the cost of adding enough new equipment to the present instructional system, to make it operationally efficient.

Cost analysis for the experimental and control course can be derived from several simple equations. This type of analysis should be made to see how the effects of cost changes as more students are training with the system. The future number of students over the next several years along with the average class size will need to be estimated for the purpose of our analysis. The formulas consider two types of costs: basic developmental costs and operational costs. It is important to note that basic developmental costs, once the investments are made, do not contributed any more to the costs of training many students than they contribute to the costs of training a few. In other words, basic developmental costs can be amortized over the life of the course. On the other hand, operational costs remain the same for each group of students, regardless of the number of groups training. One might state that it costs as much to operate the training course for the 15th group, for example, as it does to operate the course for the first group (provided the operational costs are not changed).

The formulas for calculating training output-unit costs can be stated as:

Output unit as a group of students:

$$Cg = \frac{B}{N} + O$$

where: Cg = Cost per group
B = Basic Costs
O = Operational Costs
N = Total number of students groups

Output unit as each student:

$$Cs = \frac{B}{N} + \frac{O}{n}$$

where: Cs = Cost per group
B = Basic costs
O = Operational costs
N = Total number of students who have taken the course (including the present group)
n = Number of students in the present group

In summary, the following cost analysis variables were incl ded:

| Variable | Measurement | Data Source |
|---|---|---|
| 1.0 Research and development of the course. | 1.1 Cost in dollars. | 1.2 Available records. |
| 2.0 Initial/acquisition of hardware/software. | 2.1 Cost in dollars. | 2.2 Available records. |
| 3.0 Operational costs. | 3.1 Cost in dollars. | 3.2 Available records; also projected increases by staff. |
| 4.0 Equipment Depreciation. | 4.1 Number of years. | 4.2 Available data; staff projection. |
| 5.0 Repair costs. | 5.1 Projected dollars. | 5.2 Available data; staff projection. |

Figure 7. Cost Analysis Variable

POPULATION:

The population from which the sample was derived can be defined as MOS 16H10 OSUT students assigned to AN/TSQ-73 System Console Operation course. The sample was selected from six different classes that completed the course during a five month period. Classes were scheduled to start approximately every two weeks. All students from the classes were determined to be either "field dependent" or "field independent" learners. These two groups were then randomly assigned to one of the four following treatment groups:

1. Experimental/Field Dependent.
2. Experimental/Field Independent.
3. Control/Field Dependent.
4. Control/Field Independent.

The two "experimental groups" received a portion of their practical exercise lessons by using SITS; while the two "control groups" received all of their practical exercise lessons on the actual equipment. The experimental and control groups were actually sub-divided into "field dependent" and "field independent" groups. This further subdivision was performed in an attempt to see if "cognitive style" had any effect on learning, when students were using the SITS. "Cognitive Style" for this study refers to the manner in which a person receives, processes, stores and retrieves information. Herman Witkin's Group Embedded Figure Test (EFT) was used to

determine the subjects Cognitive Style. Ideally, it would be best to use students with scores that clearly defined them as extreme field dependent or extreme field independent learners. However, this evaluation used the median score of the total sample, to determine their cognitive style. Students with scores above the median were designated field independent learners, while students below the median were designated field dependent learners. Further information about this test is presented in the instrumentation section of this report.

Deciding on the size of the sample is always a difficult task. However, one rule-of-thumb best applies: Make the sample best represent the whole group the smaller it becomes, the less one can expect its outcomes to reflect accurately what you would have obtained by testing everyone. Generally, for performing statistical analyses, a sample size of 30 is considered adequate for gaining a stable measure no matter what the size of the group being represented.

Considerable writing and discussion have been spent on the issue of sample size. Formulas have been derived for calculating a minimum sample for obtaining reliable difference. If we predict that a 10 percentage point in means might exist between the experimental and control groups on the achievement tests we can calculate the required sample size from:

$$N=2\sigma^2(Z_{\alpha/})^2+Z\beta)^2/d^2$$

N = minimum sample size
$\sigma^2$ = estimated population variance
$\alpha$ = 1- the confidence level, or the probability of rejecting the null hypothesis when it is true ( =1-.95=.05)
$\beta$ = the probability of accepting the null hypothesis when it is false.
Z = fractile of the normal curve
d = difference between independent means (10 percent)

It is estimated that the sample variance is likely to be 100 percentage points. If $\sigma^2$=100, $\alpha$=.05, and $\beta$=.10, then the required minimum sample size in each group is approximately 20 students. It should be pointed out, however, that many excellent studies have been conducted with less than the required minimum.

Three of the four treatment groups in this evaluation had 20 students assigned to them, while the fourth had 21 students. After several students were dropped from the course, at various stages, unequal group sizes resulted. Random exclusion of subjects was then used to produce equal treatment groups of 18 students. After the two experimental groups and the two control groups were combined, a total group size of 36 was available for analysis. The subject size was more than adequate when analyses were made comparing all "experimental" subjects to all "control" subjects. Comparison of the smaller groups with 18 subjects, which was not the major purpose of this evaluation, are still very close to the required sample size.

The subjective judgment questionnaires are based upon a 5-point rating scale. In calculating the sample size required, it is assumed that the desired precision of estimation is just under one-half a scale step (.49).

The usual level of confidence selected is 95 percent. In other words, we would make an error only 5 times in 100 replications of the study. The following formula can be used to calculate the required sample size:

$$N = 4\sigma^2(Z_{\alpha/2})^2/W^2$$

N = minimum sample size
$\sigma^2$ = estimated population variance
$\alpha$ = 1- the confidence level, or the probability of rejecting the null hypothesis when it is true ($\alpha$ = 1-.05 = .05)
$Z_{\alpha/2}$ = width of confidence interval (W = ± .49 = .98)
W = fractile of the normal curve corresponding to $\alpha/^2(Z_{\alpha/^2}$ = 1.96)

Generally it is considered that a 5-point scale has a sample variance between 1.00 and 1.96. If $\sigma^2$ = 1.96 then the required minimum sample size is approximately 30 students.

Once again, the major evaluation goal of comparing the experimental students to the control students is supported in the total sample size of 36. The smaller group sizes fall short of the desired sample size but are still appropriate for deriving meaning.

TREATMENT:

The AN/TSQ-73 System Console Operation Course can best be described as an individualized methodology. The lessons are under the control of the student as to how quickly they advanced toward the completion of the course. In an evaluation study of the course, during 1982, an average course completion time for students was recorded at slightly over 74 hours. The range for completion time was 62 hours to approximately 93 hours. An average time of 120 hours had been projected for student completion. The course includes a variety of individually paced media, practical exercises and examinations. The actual forms of media and their estimated times for completion are:

1. CAI - 23 hours (estimated time required for completion).
2. Sync-Tape/Slides - 23 hours (estimated time required for completion).
3. Practical Exercises - 30 hours (estimated time required for completion).
4. Programmed Text - 30 hours (estimated time required for completion).
5. Written Examinations - 11 hours (estimated time required for completion).
6. Practical Exams - 3 hours (estimated time required for completion).

Experimental and control students, in this evaluation, received the instruction that is described above. The treatment variable that differed for the two groups was found in the practical exercise component.

The experimental group for each practical exercise would first receive a SITS lesson before going to the actual equipment. The SITS lesson, as described earlier in this report, would provide the students a simulated experience with the equipment. It was believed that this simulated experience would reduce the amount of time that a student would need for practicing on the actual equipment. As soon as the student was finished with the SITS lesson, and as soon as an AN/TSQ-73 lab was available, he would receive "hands-on" experiences with the actual equipment.

The control group, in the meantime, received all of their practical exercises in the AN/TSQ-73 labs or in-other-words, on the actual equipment. Course instructors were always in the lab. They provided demonstrations of equipment and student prompting when necessary. Three AN/TSQ-73 labs were available, to the course, for instructional purposes.

It should be noted that only the time that a student spends in a lesson was recorded toward the total course completion time. In other words, the time that a student spends between completing one lesson and starting another lesson was not counted toward the course completion time. During the evaluation, students often had to wait long periods of time before starting a practical exercise on the actual equipment. However, this situation merely confirmed the shortage of actual equipment for practical exercises and the need that existed to explore alternative instructional methodologies.

INSTRUMENTS:

A number of existing instruments were used to assess student achievement. These instruments had been developed over the last several years and had been revised numerous times to increase their reliability and validity. Other instruments, such as the attitude questionnaires, were developed specifically for the evaluation. These instruments were also modified and improved as a direct result of comments from the developers and instructors.

The following instruments were used during data collection:

1. Written Achievement Tests. In order to obtain the desired specificity in the assessment of student achievements, criterion designed tests relating to the assigned instructional materials were employed. These tests included nine objective tests addressing the training tasks. The written portions of the tests were given in segments throughout the course. The last test in this group was an End-Of-Course Written Exam. The written exams were used primarily to determine if any transfer of learning was facilitated by the SITS to other cognitive learning portions of the course. Potential transfer of learning was assessed throughout the course by these achievement tests. See Appendix A for the Written Tests.

2. Performance Achievement Tests. Two performance tests were administered during the evaluation. First, a three item test was administered during the early stages of the course. A second performance test with twenty items, was administered as an End-Of-Course examination. The performance tests were developed around a go, no/go approach. The student had up to three opportunities to successfully complete each test item. See Appendix B for the Practical Examinations.

3. Available Logs and Records. Measures of time to complete the training were made available for the experimental and control groups via the computer clocking system and other booking procedures used in the course. Other logs and records were also used to collect data on the reliability of SITS. See Appendix F for Problem Log for SITS.

4. Attitude Questionnaires. Attitudes toward the experimental program were solicited from three sources (students, instructors, and other staff members). The attitudes of subjects about the experimental courses were measured as appropriate via specially prepared data gathering techniques. These items involved the direct questionnaire approach. The attitude questionnaires consisted of both five scale items of opinion and open-ended questions which were amenable to content analysis. The Attitude questionnaires solicited data for effectiveness, student acceptance, instructor acceptance and program implementation. See Appendix C and D for Student Questionnaires and Appendix E for the Instructor Questionnaire.

5. Group Embedded Figures Test (EFT). The EFT is a perceptual test. The subject's task on each trial is to locate a previously seen simple figure within a larger complex figure which has been so organized as to obscure or embed the sought-after simple figure. In the strictest interpretation, therefore, scores on the EFT reflect extent of competence at perceptual disembedding. Individual differences in EFT performance, however, appear to relate to more than differences in perceptual functioning. Over the past fifteen years, the EFT has been used in numerous research studies to examine differences in learning styles. The EFT assists in the study of "cognitive style" by classifying individuals as "Field Independent" and "Field Dependent" learners.

DATA ANALYSIS:

Data analyses for the evaluation were organized around the variables or questions of effectiveness, student acceptance, instructor acceptance, program implementation, reliability and cost factors. Instruments used for collecting data about each of these variables have been discussed in a previous section.

A statistical comparison was made of scores on the written and performance tests for the experimental and control groups. Also, a statistical comparison was made between the amount of time the experimental group and control group took to complete both the practical exercises and the course. A further statistical comparison was made to determine if the students' "cognitive style" influenced these dependent variables. Analysis of variance techniques were used to determine the significance of any difference that might have existed. Analysis of variance techniques are among the most popular statistical procedures for analyzing data from evaluation designs with two or more variables. These procedures provide an excellent vehicle for assessing any main effects and the interaction effects that might exist among the evaluation variables.

Comparisons of items from the Attitude Questionnaires were also made. Responses on thirteen items, by the experimental and the control groups, were compared. Analysis of variance techniques were again used in making these analyses. Data from Instructors End-Of-Course Questionnaire were analyzed by obtaining frequency distributions and statistical measures, such as means, medians and standard deviations.

A t-test was used to see if a significant difference existed between the experimental and control groups on a pretest. This analysis was used because the sample that was used in the evaluation had not been randomly selected from the population. They had, however, been randomly assigned to the treatment groups. The pretest used in this case was from the Aptitude Area and Subtest - General Technical. A comparison of scores from this test indicated that there was no significant difference between these groups. Data for this comparison and other comparisons are presented in the next section of this report.

## DISCUSSION

This section of the report describes the procedures used in conducting the evaluation and reports the findings. The procedures used in conducting the evaluation are outlined in a manner that presents an overview for the reader's understanding. The findings are then reported through standard data analysis procedures.

### DATA COLLECTION:

The procedures listed below were followed prior to and during the data collection stage of the evaluation.

1. A person from the school personnel at USAADASCH was assigned to administer the data collection procedures. The person was responsible for the distribution and the collection of various instruments at appropriate times.

2. A briefing was held for all instructors who would participate with the experimental and control groups. The following items were discussed.

   A. Record keeping for written exam.
   B. Record keeping for practical exam.
   C. Administration of questionnaires.
   D. Usage log.
   E. Problem log.

3. A number was assigned to each of the two SITS stations. The SITS were placed in an area that was isolated from the rest of the course. Only experimental students were allowed in the area.

4. Copies of the Problem Log for the SITS was distributed to each terminal. Each log was placed where it was easily accessible to the instructors.

5. Aptitude scores were obtained from the General Technical (GT) test area for each student in the experimental and control groups.

6. The Embedded Figures Test was administered to each student in the experimental and control groups.

7. Extra copies of the Problem Log for SITS Terminals were made available.

8. Each written exam was distributed at the appropriate time. Instructors recorded the students' first score (even though they must obtain 100% before going on). Exams were given to both the experimental and control students.

9. At the end of the course, the instructors administered the practical exam. Scores were recorded on a go, no/go basis. The exam was given to both experimental and control students. A practical exam was also administered early in the course.

10. At the end of the course, the instructors distributed, administered and collected the Student End-Of-Course Questionnaire to both experimental and control groups.

11. Research and development costs for the SITS course and the present course were gathered.

12. Data were gathered on the initial costs associated with the acquisition of hardware/software for the SITS component and the corresponding components of the present course.

13. Data were gathered on the cost of the practical exercises component of the current course.

14. Data were gathered for the operational costs and projected costs for the next five years for the SITS components and the present course.

15. Data were gathered for the estimated depreciaion of equipment and replacement for the next five years (ten would be better) for the SITS component and the present course.

16. Data were gathered on the projected costs on SITS equipment repairs for the next five years.

17. At the end of the evaluation process, the Instructor End-Of-Course Questionnaire was administered to all instructors and staff members associated with the course.

FINDINGS:

This section of the report presents the data analysis for six different variables. These variables were selected in an attempt to measure the impact that the SITS had on the AN/TSQ-73 System Console Operation course. The six variables used in this evaluation were: (1) Effectiveness; (2) Student Acceptance; (3) Instructor Acceptance; (4) Program Implementation; (5) Reliability; and (6) Cost Analysis. In addition, this evaluation examined a construct referred to as "Cognitive Style." Cognitive Style was examined to determine if SITS had differing effects on students with different cognitive styles. Preceeding the findings for these six variables are the findings of a pretest that was administered to the sample. The findings for each of these variables are now reported in numerical order in which they are presented above.

0. Pretest. Scores from a pretest were analyzed to determine if any difference existed between the experimental and control groups. An analysis was also made of scores from the field dependent students and the field independent students (Cognitive Style). These analyses were made because the sample had not been randomly selected from the population. A summary of the subjects' scores on the Pretest for the Experimental and Control groups are presented in Table 1.

TABLE 1
Pretest Results for
Experimental (E) and Control (C) Groups

| Groups | N | Means | SD | t-test |
|---|---|---|---|---|
| E-Group | 36 | 111.889 | 11.091 | -.093 |
| C-Group | 36 | 112.111 | 9.730 | |

An analysis of the data resulted in a t value of -.093 with 70 degrees of freedom. The absolute value (-.093) obtained was less than the required critical value for the .05 alpha level (1.992). Therefore, no significant difference was found between the E- and C-Groups on the Pretest.

Table 2 presents a summary of the Pretest scores for the Field Dependent Students and the Field Independent Students.

TABLE 2
Pretest Results for
Field Dependent (D) and Field Independent (I) Groups

| Groups | N | Means | SD | t-test |
|---|---|---|---|---|
| D-Group | 36 | 111.694 | 7.791 | .252 |
| I-Group | 36 | 112.305 | 12.409 | |

An analysis of the data resulted in a t value of .252 with 70 degrees of freedom. The absolute value (.252) obtained was less than the critical value for the .05 alpha level (1.992). Therefore, no significant difference was found between the D- and I-Groups on the Pretest.

The two analyses of the Pretest data resulted in no significant difference. Since no significant difference was found on these measures, it was decided that the Pretest would not need to be employed as a covariable in further analyses.

1. Effectiveness. The evaluation plan utilized seven different sources to evaluate the effectiveness of the SITS. The findings from these sources are now presented in the order that the sources are listed in Figure 2.

1a. Nine written tests were used to assess the students' cognitive skill achievement. These tests were administered to see if students were making any transfer of learning from the SITS lessons to other components of the course. Any increase in learning, as measured by the written tests, could be contributed to the difference in the treatment (SITS) that the students received. A summary of the subjects' scores on Written Test 1 for the various groupings, is presented in Table 3 and an Analysis of Variance of these data is reported in Table 4.

The analysis of variance of means, comparing the experimental and control groups (Treatment), yielded an F-value of .806 which was not significant at the P=.372 level. An analysis of variance of means, comparing Field Dependent and Field Independent groups (Cognitive Style), yielded an F-value of 4.080 which was significant at P=.047. This finding indicates that Field Independent students scored significantly higher than did Field Dependent students. The analysis of variance for interaction effects between the type of treatment and the type of cognitive study yielded an F-value of .655 which was not significant at P=.655.

TABLE 3
Written Test 1 Results for
Experimental (E), Control (C),
Field Dependent (D), and Field Independent (I) Groups

| Groups | N | Means | Median | SD |
|---|---|---|---|---|
| E-Group | 36 | 30.056 | 30.333 | 2.390 |
| C-Group | 36 | 30.500 | 30.625 | 1.844 |
| D-Group | 36 | 29.778 | 30.100 | 2.508 |
| I-Group | 36 | 30.778 | 30.750 | 1.551 |
| D,E-Group | 18 | 29.442 | 29.541 | 1.434 |
| D,C-Group | 18 | 30.111 | 30.500 | 1.967 |
| I,E-Group | 18 | 30.667 | 30.700 | 1.455 |
| I,C-Group | 18 | 30.889 | 30.833 | 1.676 |

TABLE 4
Analysis of Variance Comparing
Student Achievement on Written Test 1

| Source of Variation | Sum of Squares | Degrees of Freedom | Means | F-Value |
|---|---|---|---|---|
| Treatment | 3.556 | 1 | 3.556 | .806 |
| Cognitive Style | 18.000 | 1 | 18.000 | 4.080* |
| Treatment X Cognitive | .889 | 1 | .889 | .655 |
| Residual | 300.000 | 68 | 4.412 | |

*Significant at or above the .05 level.

A summary, of the subjects scores on Written Test 2 for the various groupings is presented in Table 5 and an Analysis of Variance of these data is reported in Table 6.

TABLE 5
Written Test 2 Results for
Experimental (E), Control (C),
Field Dependent (D), and Field Independent (I) Groups

| Groups | N | Means | Median | SD |
|---|---|---|---|---|
| E-Group | 36 | 46.167 | 46.357 | 2.223 |
| C-Group | 36 | 43.306 | 42.500 | 4.027 |
| D-Group | 36 | 44,832 | 44.912 | 3.573 |
| I-Group | 36 | 45.389 | 46.500 | 3.425 |
| D,E-Group | 18 | 45.832 | 45.912 | 2.144 |
| D,C-Group | 18 | 42.333 | 41.500 | 3.926 |
| I,E-Group | 18 | 46.500 | 46.700 | 2.358 |
| I,C-Group | 18 | 44.278 | 45.500 | 3.997 |

TABLE 6
Analysis of Variance Comparing
Student Achievement on Written Test 2

| Source of Variation | Sum of Squares | Degrees of Freedom | Means Square | F-Value |
|---|---|---|---|---|
| Treatment | 147.347 | 1 | 147.347 | 14.261* |
| Cognitive Style | 30.681 | 1 | 30.681 | 2.969 |
| Treatment X Cognitive Style | 7.347 | 1 | 7.347 | .711 |
| Residual | 702.611 | 68 | 10.333 | |

*Significant at or above the .05 level.

The analysis of variance of means, comparing the experimental and control groups (Treatment), yielded an F-value of 14.261 which was significant at the P=.001 level. This finding indicates that the Experimental students scored significantly higher than did the Control students. An analysis of variance of means, comparing Field Dependent and Field Independent (Cognitive Style), yielded an F-value of 2.969 which was not significant at the P=.089 level. The analysis of variance for interaction effects between the type of Treatment and the type of Cognitive Style yielded an F-value of .711 which was not significant at P=.402.

A summary of the subjects' scores on Written Test 3 for the various groupings, is presented in Table 7 and an analysis of variance of these data is reported in Table 8.

TABLE 7
Written Test 3 Results for
Experimental (E), Control (C),
Field Dependent (D), and Field Independent (I) Groups

| Groups | N | Means | Median | SD |
|---|---|---|---|---|
| E-Group | 36 | 44.806 | 44.700 | 2.149 |
| C-Group | 36 | 44.278 | 44.500 | 2.491 |
| D-Group | 36 | 44.361 | 44.500 | 2.727 |
| I-Group | 36 | 44.722 | 44.667 | 1.861 |
| D,E-Group | 18 | 44.783 | 44.822 | 1.732 |
| D,C-Group | 18 | 43.944 | 43.500 | 2.879 |
| I,E-Group | 18 | 44.833 | 44.500 | 1.689 |
| I,C-Group | 18 | 44.611 | 44.833 | 2.062 |

TABLE 8
Analysis of Variance Comparing
Student Achievement on Writte.. Test 3

| Source of Variation | Sum of Squares | Degree of Freedom | Means Square | F-Value |
|---|---|---|---|---|
| Treatment | 5.014 | 1 | 5.014 | .910 |
| Cognitive Style | 2.347 | 1 | 2.347 | .426 |
| Treatment X Cognitive Style | 1.681 | 1 | 1.681 | .305 |
| Residual | 374.833 | 68 | 5.512 | |

The analysis of variance of means, comparing the experimental and control groups (Treatment), yielded an F-value of .910 which was not significant at the P=.344 level. An analysis of variance of means, comparing Field Dependent and Field Independent groups (Cognitive Style), yielded an F-value of .426 which was not significant at the P=.516 level. The analysis of variance for interaction effects between the type of Treatment and the type of Cognitive Style yielded an F-value of .305 which was not significant at P=.583.

A summary of the subjects' scores on Written Test 4 for the various groupings is presented in Table 9 and an analysis of variance of these data is reported in Table 10.

TABLE 9
Written Test 4 Results for
Experimental (E), Control (C),
Field Dependent (D), and Field Independent (I) Groups

| Groups | N | Means | Median | SD |
|---|---|---|---|---|
| E-Group | 36 | 32.472 | 32.700 | 1.576 |
| C-Group | 36 | 31.278 | 31.643 | 2.133 |
| D-Group | 36 | 31.194 | 31.500 | 1.833 |
| I-Group | 36 | 32.556 | 33.000 | 1.858 |
| D,E-Group | 18 | 32.000 | 32.132 | 1.624 |
| D,C-Group | 18 | 30.389 | 30.500 | 1.787 |
| I,E-Group | 18 | 32.944 | 33.167 | 1.514 |
| I,C-Group | 18 | 32.167 | 32.750 | 2.121 |

TABLE 10
Analysis of Variance Comparing
Student Achievement on Written Test 4

| Source of Variation | Sum of Squares | Degree of Freedom | Means Square | F-Value |
|---|---|---|---|---|
| Treatment | 25.681 | 1 | 25.681 | 8.327* |
| Cognitive Style | 33.347 | 1 | 33.347 | 10.812* |
| Treatment X Cognitive Style | 3.125 | 1 | 3.125 | 1.013 |
| Residule | 209.722 | 68 | 3.084 | |

*Significant at or above the .05 level.

The analysis of variance of means, comparing the experimental and the control groups (Treatment), yielded an F-value of 8.327 which was significant at the P=.005 level. This finding indicates that the experimental students scored significantly higher than did the control students. The analysis of variance of means, comparing Field Dependent and Field Independent groups (Cognitive Style), yielded an F-value of 10.812 which was significant at the P=.002 level. This finding indicates that the Field Independent students scored significantly higher than did the Field Dependent students. The

analysis of variance for interaction effects between the type of Treatment and the type of Cognitive Style yielded an F-value of 1.013 which was not significant at P=.318.

A summary of the subjects' scores on Written Test 5 for the various groupings, is presented in Table 11 and an analysis of variance of these data is reported in Table 12.

TABLE 11
Written Test 5 Results for
Experimental (E), Control (C),
Field Dependent (D), and Field Independent (I) Groups

| Groups | N | Means | Median | SD |
|---|---|---|---|---|
| E-Group | 36 | 27.528 | 27.643 | 1.630 |
| C-Group | 36 | 26.750 | 26.700 | 1.933 |
| D-Group | 36 | 26.722 | 26.875 | 1.936 |
| I-Group | 36 | 27.556 | 27.700 | 1.611 |
| D,E-Group | 18 | 27.282 | 27.291 | 1.732 |
| D,C-Group | 18 | 26.167 | 25.500 | 2.093 |
| I,E-Group | 18 | 27.778 | 28.000 | 1.629 |
| I,C-Group | 18 | 27.333 | 27.500 | 1.609 |

TABLE 12
Analysis of Variance Comparing
Student Achievement on Written Test 5

| Source of Variation | Sum of Squares | Degree of Freedom | Means Square | F-Value |
|---|---|---|---|---|
| Treatment | 10.889 | 1 | 10.889 | 3.539 |
| Cognitive Style | 12.500 | 1 | 12.500 | 4.063* |
| Treatment X Cognitive Style | 2.000 | 1 | 2.000 | .650 |
| Residual | 209.222 | 68 | 3.077 | |

*Significant at or above the .05 level.

The analysis of variance of means, comparing the experimental and control groups (Treatment), yielded an F-value of 3.539 which was significant at the P=.064 level. This finding indicates that the experimental students

scored significantly higher than did the control students. An analysis of variance of means, comparing Field Dependent and Field Independent groups (Cognitive Style), yielded an F-value of 4.063 which was significant at P=.048 level. This finding indicates that Field Independent Students scored significantly higher than did Field Dependent students. The analysis of variance for interaction effects between the type of Treatment and the type of Cognitive Style yielded an F-value of .650 which was not significant at P=.423 level.

A summary of the subjects' scores on Written Test 6 for the various groupings is presented in Table 13 and an analysis of variance of these data is reported in Table 14.

TABLE 13
Written Test 6 Results for
Experimental (E), Control (C),
Field Dependent (D), and Field Independent (I) Groups

| Groups | N | Means | Median | SD |
|---|---|---|---|---|
| E-Group | 36 | 35.861 | 35.833 | 1.726 |
| C-Group | 36 | 35.556 | 35.643 | 2.063 |
| D-Group | 36 | 35.556 | 35.786 | 2.006 |
| I-Group | 36 | 35.861 | 35.667 | 1.791 |
| D,E-Group | 18 | 35.556 | 35.621 | 1.822 |
| D,C-Group | 18 | 35.556 | 36.167 | 2.332 |
| I,E-Group | 18 | 36.167 | 36.500 | 1.756 |
| I,C-Group | 18 | 35.556 | 35.333 | 1.822 |

TABLE 14
Analysis of Variance Comparing
Student Achievement on Written Test 6

| Source of Variation | Sum of Squares | Degree of Freedom | Means Square | F-Value |
|---|---|---|---|---|
| Treatment | 1.681 | 1 | 1.681 | .457 |
| Cognitive Style | 1.681 | 1 | 1.681 | .457 |
| Treatment X Cognitive Style | 1.681 | 1 | 1.681 | .457 |
| Residual | 249.833 | 68 | 3.674 | |

The analysis of variance of means, for all comparison on Written Test 6, yielded an F-value of .457 which was not significant at the P=.501 level.

A summary, of the subjects' scores on Written Test 7 for the various groupings, is presented in Table 15 and an analysis of variance of these data is reported in Table 16.

TABLE 15
Written Test 7 Results for
Experimental (E), Control (C),
Field Dependent (D), and Field Independent (I) Groups

| Groups | N | Means | Median | SD |
|---|---|---|---|---|
| E-Group | 36 | 31.694 | 31.700 | 2.012 |
| C-Group | 36 | 31.000 | 31.056 | 1.757 |
| D-Group | 36 | 31.056 | 30.750 | 1.999 |
| I-Group | 36 | 31.639 | 31.500 | 1.791 |
| D,E-Group | 18 | 31.440 | 31.421 | 1.668 |
| D,C-Group | 18 | 30.667 | 30.333 | 1.910 |
| I,E-Group | 18 | 31.944 | 31.833 | 1.984 |
| I,C-Group | 18 | 31.333 | 31.357 | 1.572 |

TABLE 16
Analysis of Variance Comparing
Student Achievement on Written Test 7

| Source of Variation | Sum of Squares | Degree of Freedom | Means Square | F-Value |
|---|---|---|---|---|
| Treatment | 8.681 | 1 | 8.681 | 2.425 |
| Cognitive Style | 6.125 | 1 | 6.125 | 1.711 |
| Treatment X Cognitive Style | .125 | 1 | .125 | .035 |
| Residual | 243.389 | 68 | 3.579 | |

The analysis of variance of means, comparing the experimental and control groups (Treatment), yielded an F-value of 2.425 which was not significant at the P=.124 level. An analysis of variance of means, comparing Field Dependent and Field Independent groups (Cognitive Style), yielded an F-value of 1.711 which was not significant at P=.195 level. The analysis of variance for interaction effects between the type of treatment and the type of cognitive style yielded an F-value of .035 which was not significant at P=.852.

A summary of the subjects' scores on Written Test 8 for the various groupings, is presented in Table 17 and an analysis of variance of these data is reported in Table 18.

TABLE 17
Written Test 8 Results for
Experimental (E), Control (C),
Field Dependent (D), and Field Independent (I) Groups

| Groups | N | Means | Median | SD |
|---|---|---|---|---|
| E-Group | 36 | 28.583 | 28.786 | 1.156 |
| C-Group | 36 | 27.972 | 28.278 | 1.576 |
| D-Group | 36 | 28.194 | 28.400 | 1.508 |
| I-Group | 36 | 28.361 | 28.700 | 1.313 |
| D,E-Group | 18 | 28.500 | 28.500 | 1.121 |
| D,C-Group | 18 | 27.889 | 28.167 | 1.745 |
| I,E-Group | 18 | 28.667 | 28.875 | 1.138 |
| I,C-Group | 18 | 28.056 | 28.500 | 1.434 |

TABLE 18
Analysis of Variance Comparing
Student Achievement on Written Test 8

| Source of Variation | Sum of Squares | Degree of Freedom | Means Square | F-Value |
|---|---|---|---|---|
| Treatment | 6.722 | 1 | 6.722 | 3.431 |
| Cognitive Style | .500 | 1 | .500 | .255 |
| Treatment X Cognitive Style | .000 | 1 | .000 | .000 |
| Residual | 133.222 | 68 | 1.959 | |

The analysis of variance of means, comparing the experimental and control groups (Treatment), yielded an F-value of 3.431 which was not significant at the P=.068 level. An analysis of variance of means, comparing Field Dependent and Field Independent groups (Cognitive Style), yielded an F-value of .255 which was not significant at P=.615 level. The analysis of variance for interaction effects between the type of Treatment and the type of Cognitive Style yielded an F-value of .000 which was not significant at the P=.999 level.

A summary of the subjects' scores on Written Test 9 for the various groupings, is presented in Table 19 and an analysis of variance of these data is reported in Table 20.

TABLE 19
Written Test 9 Results for
Experimental (E), Control (C),
Field Dependent (D), and Field Independent (I) Groups

| Groups | N | Means | Median | SD |
|---|---|---|---|---|
| E-Group | 36 | 68.778 | 68.667 | 2.631 |
| C-Group | 36 | 64.306 | 64.500 | 3.948 |
| D-Group | 36 | 65.944 | 66.500 | 4.091 |
| I-Group | 36 | 67.139 | 67.100 | 3.914 |
| D,E-Group | 18 | 68.443 | 68.458 | 2.637 |
| D,C-Group | 18 | 63.444 | 64.000 | 3.838 |
| I,E-Group | 18 | 69.111 | 69.000 | 2.742 |
| I,C-Group | 18 | 65.167 | 65.000 | 3.974 |

TABLE 20
Analysis of Variance Comparing
Student Achievement on Written Test 9

| Source of Variation | Sum of Squares | Degree of Freedom | Means Square | F-Value |
|---|---|---|---|---|
| Treatment | 360.014 | 1 | 360.014 | 32.332* |
| Cognitive Style | 25.681 | 1 | 25.681 | 2.306 |
| Treatment X Cognitive Style | 5.014 | 1 | 5.014 | .450 |
| Residual | 757.167 | 68 | 11.135 | |

*Significant at or above the .05 level.

The analysis of variance of means, comparing the experimental and control groups (Treatment), yielded an F-value of 32.332 which was significant at the P=.001 level. This finding indicates that the experimental students scored significantly higher than did the control students. An analysis of variance of means, comparing Field Dependent and Field Independent groups (Cognitive Style), yielded an F-value of 2.306 which was not significant at P=.133 level. The analysis of variance for interaction effects between the type of Treatment and the type of Cognitive Style yielded an F-value of .450 which was not significant at P=.504 level.

1b. Two practical examinations were used to assess students' transfer of learning from the SITS to performance on the actual equipment. One practical exam, with three items, was administered early in the course. A second practical exam, containing twenty items, was administered at the end of the course.

A summary, of the subjects' scores on the first practical examination for the various groups is presented in Table 21 and an analysis of variance of these data is reported in Table 22.

TABLE 21
Practical Examination 1 Results for
Experimental (E), Control (C),
Field Dependent (D), and Field Independent (I) Groups

| Groups | N | Means | Median | SD |
|---|---|---|---|---|
| E-Group | 36 | 2.917 | 2.955 | .280 |
| C-Group | 36 | 2.306 | 2.423 | .749 |
| D-Group | 36 | 2.472 | 2.682 | .736 |
| I-Group | 36 | 2.750 | 2.857 | .500 |
| D,E-Group | 18 | 2.890 | 2.910 | .223 |
| D,C-Group | 18 | 2.056 | 2.071 | .802 |
| I,E-Group | 18 | 2.944 | 2.971 | .236 |
| I,C-Group | 18 | 2.556 | 2.682 | .616 |

TABLE 22
Analysis of Variance Comparing
Transfer of Learning on Practical Examination 1

| Source of Variation | Sum of Squares | Degree of Freedom | Means Square | F-Value |
|---|---|---|---|---|
| Treatment | 6.722 | 1 | 6.722 | 22.729* |
| Cognitive Style | 1.389 | 1 | 1.389 | 4.696* |
| Treatment X Cognitive Style | .889 | 1 | .889 | 3 006 |
| Residual | 20.111 | 68 | .296 | |

*Significant at or above .05 level.

The analysis of variance of means, comparing the experimental and control groups (Treatment), yielded an F-value of 22.729 which was significant at P=.001 level. This finding indicated that the experimental students scored higher on the first practical examination than did the control students. This finding supports the belief that transfer of learning would take place from the SITS lessons to the actual equipment. An analysis of variance of means, comparing Field Dependent and Field Independent groups (Cognitive Style), yielded an F-value of 4.696 which was significant at P=.034 level. This finding indicates that Field Independent students scored significantly higher than did Field Dependent students. The analysis of variance for interaction effects between the type of Treatment and the type of Cognitive Style yielded an F-value of 3.006 which was not significant at P=.088 level.

A summary, of the subjects' scores on the second practical examination for the various groups, is presented in Table 25 and an analysis of variance of these data is reported in Table 26.

TABLE 23
Practical Examination 2 Results for
Experimental (E), Control (C),
Field Dependent (D), and Field Independent (I) Groups

| Groups | N | Means | Median | SD |
|---|---|---|---|---|
| E-Group | 36 | 19.861 | 19.955 | .543 |
| C-Group | 36 | 17.667 | 18.056 | 2.342 |
| D-Group | 36 | 18.556 | 19.643 | 2.348 |
| I-Group | 36 | 18.972 | 19.717 | 1.630 |
| D,E-Group | 18 | 19.780 | 19.876 | .136 |
| D,C-Group | 18 | 17.333 | 18.000 | 2.765 |
| I,E-Group | 18 | 19.944 | 19.971 | .236 |
| I,C-Group | 18 | 18.000 | 18.071 | 1.847 |

TABLE 24
Analysis of Variance Comparing
Transfer of Learning on Practical Examination 2

| Source of Variation | Sum of Squares | Degree of Freedom | Means Square | F-Value |
|---|---|---|---|---|
| Treatment | 86.681 | 1 | 86.681 | 29.761* |
| Cognitive Style | 3.125 | 1 | 3.125 | 1.073 |
| Treatment X Cognitive Style | 1.125 | 1 | 1.125 | .386 |
| Residual | 198.056 | 68 | 2.913 | |

*Significant at or above the .05 level.

The analysis of variance of means, comparing the experimental and control groups (Treatment), yielded an F-value of 29.761 which was significant at P=.001 level. This finding indicates that the experimental students scored higher on the second practical examination than did the control students. This finding also supports the belief that transfer of learning would take place from the SITS lessons to the actual equipment. An analysis of variance of means, comparing Field Dependent and Field Independent groups (Cognitive Style), yielded an F-value of 3.125 which was not significant at the P=.304 level. The analysis of variance for interaction effect between the type of Treatment and the type of Cognitive Style yielded an F-value of .386 which was not significant at P=.536 level.

1c. The effectiveness variable was also examined in relationship to the amount of time (speed of skill acquisition) that students spent in training. Two types of measurements were used in this analysis. The first measurement examined the amount of actual equipment time that students needed to complete their practical exercises. This measurement was examined in an effort to determine if students using the SITS lessons would require less hands-on time with the actual equipment. The second measurement examined the amount of time required to complete the entire course.

A summary of the subjects' scores on the length of time spent in practical exercises (actual equipment time) for the various groups is presented in Table 25 and an analysis of variance of the data is reported in Table 26.

TABLE 25
Results of Practical Exercise Time for
Experimental (E), Control (C),
Field Dependent (D), and Field Independent (I) Groups

| Groups | N | Means | Median | SD |
|---|---|---|---|---|
| E-Group | 36 | 1143.167 | 1137.500 | 82.109 |
| C-Group | 36 | 1329.639 | 1336.500 | 105.205 |
| D-Group | 36 | 1244.667 | 1227.500 | 122.029 |
| I-Group | 36 | 1228.139 | 1195.500 | 143.740 |
| D,E-Group | 18 | 1154.940 | 1134.500 | 112.635 |
| D,C-Group | 18 | 1334.389 | 1337.000 | 103.399 |
| I,E-Group | 18 | 1131.389 | 1150.500 | 103.282 |
| I,C-Group | 18 | 1324.889 | 1314.500 | 109.764 |

TABLE 26
Analysis of Variance Comparing
Student Times in Practical Exercises

| Source of Variation | Sum of Squares | Degree of Freedom | Means Square | F-Value |
|---|---|---|---|---|
| Treatment | 625894.014 | 1 | 625894.014 | 68.919* |
| Cognitive Style | 4917.014 | 1 | 4917.014 | .541 |
| Treatment X Cognitive Style | 889.014 | 1 | 889.014 | .098 |
| Residual | 617545.278 | 68 | 9081.548 | |

*Significant at or above the .05 level.

The analysis of variance of means comparing the experimental and control groups (Treatment), yielded an F-value of 68.919 which was significant at the P=.001 level. This finding indicates that the experimental students required significantly less hands-on-time with the actual equipment than did the control students. The analysis of variance of means, comparing Field Dependent and Field Independent groups (Cognitive Style), yielded an F-value of .541 which was not significant at the P=.464 level. An analysis of variance for interaction effects between the type of Treatment and the type of Cognitive Style yielded an F-value of .098 which was not significant at P=.755.

A summary of the subjects' time for completing the entire course for the various groups, is presented in Table 27 and an analysis of variance of these data if reported in Table 28.

TABLE 27
Results of Total Course Time for
Experimental (E), Control (C)
Field Dependent (D), and Field Independent (I) Groups

| Groups | N | Means | Median | SD |
|---|---|---|---|---|
| E-Group | 36 | 3729.806 | 3622.000 | 423.988 |
| C-Group | 36 | 4269.944 | 4243.000 | 623.806 |
| D-Group | 36 | 4087.556 | 4031.000 | 610.716 |
| I-Group | 36 | 3912.194 | 3821.000 | 574.590 |
| D,E-Group | 18 | 3741.280 | 3588.000 | 525.646 |
| D,C-Group | 18 | 4433.833 | 4381.000 | 141.331 |
| I,E-Group | 18 | 3718.333 | 3615.000 | 464.118 |
| I,C-Group | 18 | 4106.056 | 3912.500 | 620.271 |

TABLE 28
Analysis of Variance Comparing
Course Completion Times

| Source of Variation | Sum of Squares | Degree of Freedom | Means Square | F-Value |
|---|---|---|---|---|
| Treatment | 5251500.347 | 1 | 5251500.347 | 18.855* |
| Cognitive Style | 553527.347 | 1 | 553527.347 | 1.987 |
| Treatment X Cognitive Style | 418155.125 | 1 | 418155.125 | 1.501 |
| Residual | 18939815.056 | 68 | 278526.692 | |

*Significant at or above .05 level.

The analysis of variance of means comparing the experimental and control groups (Treatment), yielded an F-value of 18.855 which was significant at the P=.001 level. This finding indicates that the experimental students required significantly less time to complete the course than did the control students. The analysis of variance of means comparing Field Dependent and Field Independent groups (Cognitive Style), yielded an F-value of 1.987 which was not significant at the P=.163 level. Analysis of variance for interaction effects between the type of Treatment and the type of Cognitive Style yeilded an F-value of 1.501 which was not significant at the P=.225 level.

It should be noted that the analyses in Table 26 and Table 28 do not consider the amount of time that the experimental students spent with the SITS lessons. This time was excluded because the evaluation was primarily interested in determining if the SITS lessons would reduce the amount of time that students needed on the actual equipment. However, the experimental students did require more time in the practical exercises and the entire course when the average SITS time (average of 16 hours and 6 minutes) was included. The average practical exercise time for the experimental students was 35 hours and 8 minutes when the SITS lessons were included. The control students in the meantime used 22 hours and 9 minutes. The average course completion time for the experimental students was 78 hours and 15 minutes when the SITS lessons were included. The control students used 71 hours and 10 minutes in completing the course. Implications for these findings are presented in the Summary and Conclusion section of this report.

1d. Speed of acquisition from the SITS lessons, as perceived by the student, was used to assist in the analysis of the effectiveness variable. The following items, from experimental and control questionnaires, were used in data gathering: "I feel that I was able to complete the practical exercises in a reasonable amount of time." The instruments used a five item rating scale with 5 indicating a high rating and 1 indicating a low rating (See Appendices C and D for the two Student End-Of-Course Questionnaires).

A summary, of the subjects' scores on the preceived speed of acquisition for the various groups, is presented in Table 29 and an analysis of variance of these data is presented in Table 30.

TABLE 29
Student Perceived Speed of Skill
Acquisition for Experimental (E), Control (C),
Field Dependent (D), And Field Independent (I) Groups

| Groups | N | Means | Median | SD |
|---|---|---|---|---|
| E-Group | 36 | 4.472 | 4.600 | .654 |
| C-Group | 36 | 3.611 | 3.500 | 1.128 |
| D-Group | 36 | 3.944 | 4.100 | 1.040 |
| I-Group | 36 | 4.139 | 4.400 | .990 |
| D,E-Group | 18 | 4.502 | 4.532 | .546 |
| D,C-Group | 18 | 3.389 | 3.214 | 1.092 |
| I,E-Group | 18 | 4.444 | 4.600 | .705 |
| I,C-Group | 18 | 3.833 | 4.000 | 1.150 |

TABLE 30
Analysis of Variance Comparing
Student Perceived Speed of Skill Acquisition

| Source of Variation | Sum of Squares | Degree of Freedom | Means Square | F-Value |
|---|---|---|---|---|
| Treatment | 13.347 | 1 | 13.347 | 15.724* |
| Cognitive Style | .681 | 1 | .681 | .802 |
| Treatment X Cognitive Style | 1.125 | 1 | 1.125 | 1.325 |
| Residual | 57.722 | 68 | .849 | |

*Significant at or above the .05 level.

The analysis of variance of means, comparing the experimental and control groups (Treatment), yielded an F-value of 15.724 which was significant at the P=.001 level. This finding indicates that the experimental students were more positive than the control students about their perceived speed of skill acquisition. An analysis of variance, comparing Field Dependent and Field Independent groups (Cognitive Style), yielded an F-value of .802 which was not significant at the P=.374 level. The analysis of variance for interaction effects between the type of Treatment and the type of Cognitive Style yielded an F-value of 1.325 which was not significant at the P=.254 level.

Speed of acquisition from the SITS lesson, as perceived by the instructors was also used to analyze the effectiveness variable. The following item was used in data gathering. "The student using the 'Student Interactive Training System,' was able to complete the practical exercises in a reasonable amount of time." The instrument used a five item rating scale with 5 indicating a high rating and 1 a low rating (See Appendix E for Instructor End-Of-Course Questionnaire). Descriptive statistics for this item are reported in Table 31 and the frequency distribution of scores is reported in Table 32. The findings indicated that 90% of the instructors believed that the SITS lessons contributed to the students speed of skill acquisition in relationship to the AN/TSQ-73 System. Another 10% of the instructors were neutral about the SITS contribution to student speed of skill acquisition.

TABLE 31
Descriptive Statistics for
Instructors' Perceived Speed of Skill Acquisition

| Mean | Median Score | SD | Number of Scores | % of Acceptance | % Neutral | % of Non-Acceptance |
|---|---|---|---|---|---|---|
| 4.100 | 4.071 | .568 | 10 | 90 | 10 | 0 |

TABLE 32
Frequency Distribution for the
Data in Table 31

| Scores | Frequency (f) |
|---|---|
| 5 | 2 |
| 4 | 7 |
| 3 | 1 |
| 2 | 0 |
| 1 | 0 |
| | $\Sigma f=10$ |

le. Confidence in learning from the SITS lessons, as perceived by the student, was another measurement of the effectiveness variable. The following two statements were used for data collection: (1) "I am confident that the SITS lessons and practical exercises, in the course, helped me to develop a high level of ability in performing the AN/TSQ-73 Console Operations," (See Appendix C for Student-End-Of-Course Questionnaire: Form E [Experimental]); and (2) "I am confident that the practical exercises, in the course, helped me to develop a high level of ability in performing the AN/TSQ-73 Console Operation," (See Appendix D for Student End-Of-Course Questionnaire: Form C [Control] ).

A summary, of the subjects' scores on perceived confidence of learning for the various groups, is presented in Table 33 and an analysis of variance of the data is presented in Table 34.

TABLE 33
Student Perceived Confidence in
Learning for Experimental (E), Control (C),
Field Dependent (D), and Field Independent (I) Groups

| Groups | N | Means | Median | SD |
|---|---|---|---|---|
| E-Group | 36 | 4.556 | 4.643 | .558 |
| C-Group | 36 | 3.361 | 3.222 | .990 |
| D-Group | 36 | 3.972 | 4.056 | .971 |
| I-Group | 36 | 3.944 | 4.083 | 1.040 |
| D,E-Group | 18 | 4.612 | 4.627 | .487 |
| D,C-Group | 18 | 3.333 | 3.136 | .907 |
| I,E-Group | 18 | 4.500 | 4.600 | .618 |
| I,C-Group | 18 | 3.389 | 3.357 | 1.092 |

TABLE 34
Analysis of Variance Comparing
Student Perceived Confidence in Learning

| Source of Variation | Sum of Squares | Degree of Freedom | Means Square | F-Value |
|---|---|---|---|---|
| Treatment | 25.681 | 1 | 25.681 | 38.758* |
| Cognitive Style | .014 | 1 | .014 | .021 |
| Treatment X Cognitive Style | .125 | 1 | .125 | .189 |
| Residual | 45.056 | 68 | .663 | |

*Significant at or above the .05 level.

The analysis of variance of means, comparing the experimental and control groups (Treatment), yielded an F-value of 38.758 which was significant at the P=.001 level. This finding indicated that the experimental students were more confident about their learning the AN/TSQ-73 skills than were the control students. An analysis of variance, comparing Field Dependent and Field Independent groups (Cognitive Style) yielded an F-value of .021 which was not significant at the P=.885 level. The analysis of variance for interaction effects between

Treatment and the Cognitive Style yielded an F-value of .189 which was not significant at the P=.665 level.

1f. Attention to learning from the SITS lessons, as perceived by the students, was used to assess the effectiveness variable. The following two statements were used for data collection: (1) "I found it easy to pay attention to the SITS lessons and the practical exercises, included in the AN/TSQ-73 Console Operation Course," (See Appendix C for Student-End-Of-Course Questionnaire: Form E [Experimental] ); and (2) "I did not have any difficulty in paying attention to the practical exercise portion of the AN/TSQ-73 Console Operator Course," (See Appendix D for Student-End-Of-Course Questionnaire: Form C [Control] ).

A summary, of the subjects' scores on perceived attention to learning for the various groups, is presented in Table 35 and an analysis of variance of these data is presented in Table 36.

TABLE 35
Student Perceived Attention to
Learning for Experimental (E), Control (C),
Field Dependent (D), and Field Independent (I) Groups

| Groups | N | Means | Median | SD |
|---|---|---|---|---|
| E-Group | 36 | 4.306 | 4.289 | .624 |
| C-Group | 36 | 4.278 | 4.250 | .615 |
| D-Group | 36 | 4.306 | 3.289 | .624 |
| I-Group | 36 | 4.278 | 4.250 | .615 |
| D,E-Group | 18 | 4.221 | 4.273 | .622 |
| D,C-Group | 18 | 4.389 | 4.389 | .608 |
| I,E-Group | 18 | 4.389 | 4.389 | .608 |
| I,C-Group | 18 | 4.167 | 4.136 | .618 |

TABLE 36
Analysis of Variance Comparing
Student Perceived Attention to Learning

| Source of Variation | Sum of Squares | Degree of Freedom | Means Square | F-Value |
|---|---|---|---|---|
| Treatment | .014 | 1 | .014 | .036 |
| Cognitive Style | .014 | 1 | .014 | .036 |
| Treatment X Cognitive Style | .681 | 1 | .681 | 1.769 |
| Residual | 26.167 | 68 | .385 | |

The analysis of variance of means, comparing the experimental and control groups (Treatment) yielded an F-value of .036 which was not significant at the P=.965 level. An analysis of variance, comparing Field Dependent and Field Independent groups (Cognitive Style) yeilded an F-value of .036 which was not significant at the P=.965 level. The analysis of variance for interaction effects between Treatment and the Cognitive Style yielded an F-value of 1.769 which was not significant at the P=.188 level.

Attention to learning from the SITS, as perceived by the instructors, was also used to analyze the effectiveness variable. The following statement was used for data collection: "The students using the 'Student Interactive Training System' did not have any difficulty in paying attention to the practical exercise portion of the AN/TSQ-73 Console Operations Course," (See Appendix E for Instructor End-Of-Course Questionnaire). Descriptive statistics for this item are reported in Table 37 and the frequency distribution of scores is reported in Table 38. The finding indicates that 90% of the instructors believed that it was easy for the students to pay attention to the SITS lessons. Another 10% of the instructors were neutral about whether or not students paid close attention to the SITS lessons.

TABLE 37
Descriptive Statistics for
Instructors' Perceived Student Attention

| Mean | Median Score | SD | Number of Scores | % of Acceptance | % Neutral | % of Non-Acceptance |
|---|---|---|---|---|---|---|
| 4.300 | 4.300 | .675 | 10 | 90 | 10 | 0 |

TABLE 38
Frequency Distribution for the
Data in Table 37

| Scores | Frequency (f) |
|---|---|
| 5 | 4 |
| 4 | 5 |
| 3 | 1 |
| 2 | 0 |
| 1 | 0 |
| | $\Sigma F=10$ |

1g. Transfer of learning from the SITS lessons, as perceived by the student was used to evaluate the effectiveness variable. The following two statements were used for data collection: (1) "The SITS lessons and practical exercises helped me to perform the tasks required in operating the AN/TSQ-73 Console," (See Appendix C for Student End-Of-Course Questionnaire: Form E [Experimental] ); and (2) "The practical exercises helped me to perform the tasks required in operating the AN/TSQ-73 Console," (See Appendix D for Student End-Of-Course Questionnaire: Form C [Control]).

A summary, of the subjects' scores on the perceived transfer of learning for the various groups, is presented in Table 39 and an analysis of variance of these data is presented in Table 40.

TABLE 39
Student Perceived Transfer of
Learning for Experimental (E), Control (C),
Field Dependent (D), and Field Independent (I) Groups

| Groups | N | Means | Median | SD |
|---|---|---|---|---|
| E-Group | 36 | 4.667 | 4.750 | .478 |
| C-Group | 36 | 4.194 | 4.184 | .668 |
| D-Group | 36 | 4.472 | 4.447 | .506 |
| I-Group | 36 | 4.389 | 4.553 | .728 |
| D,E-Group | 18 | 4.614 | 4.632 | .543 |
| D,C-Group | 18 | 4.333 | 4.250 | .485 |
| I,E-Group | 18 | 4.722 | 4.808 | .461 |
| I,C-Group | 18 | 4.056 | 4.071 | .802 |

TABLE 40
Analysis of Variance Comparing
Student Perceived Transfer of Learning

| Source of Variation | Sum of Squares | Degree of Freedom | Means Square | F-Value |
|---|---|---|---|---|
| Treatment | 4.014 | 1 | 4.014 | 11.954* |
| Cognitive Style | .125 | 1 | .125 | .372 |
| Treatment X Cognitive Style | .681 | 1 | .681 | 2.027 |
| Residual | 22.833 | 68 | .336 | |

*Significant at or above the .05 level.

The analysis of variance of means, comparing the experimental and control groups (Treatment), yielded an F-value of 11.954 which was significant at the .001 level. This finding indicates that the experimental students rated their transfer of learning higher than did the control students. An analysis of variance of means, comparing Field Dependent and Field Independent groups (Cognitive Style), yielded an F-value of .372 which was not significant at the P=.544 level. The analysis of variance for interaction effects between the type of Treatment and the type of Cognitive Style yielded an F-value of 2.027 which was not significant at P=.159.

Transfer of learning from the SITS lessons, as perceived by the instructors was also examined. The following statement was used for data collection: "The students using the 'Student Interactive Training System," developed a high level of ability in performing the AN/TSQ-73 Console Operations," (See Appendix E for Instructor End-Of-Course Evaluation). Descriptive statistics for this item are reported in Table 41 and the frequency distribution of scores is reported in Table 42.

The findings indicate that 90% believed that the SITS helped students in the transfer of learning to the operation of the AN/TSQ-73 System. Another 10% of the instructors were neutral on the student transfer issue.

TABLE 41
*Descriptive Statistics for*
Instructors' Perceived Student Transfer of Learning

| Mean | Median Score | SD | Number of Scores | % of Acceptance | % Neutral | % of Non-Acceptance |
|---|---|---|---|---|---|---|
| 4.100 | 4.071 | .568 | 10 | 90 | 10 | 0 |

TABLE 42
Frequency Distribution for the
Data in Table 42

| Scores | Frequency (F) |
|---|---|
| 5 | 2 |
| 4 | 7 |
| 3 | 1 |
| 2 | 0 |
| 1 | 0 |
| | $\Sigma F=10$ |

2. Student Acceptance: Information about student acceptance of the SITS lessons was collected from four different sources. The findings from these sources are now presented.

2a. The evaluation attempted to assess the students' attitude toward the overall AN/TSQ-73 Console Operation course. The following statement was used to gather data from students for analyzing student acceptance: "The AN/TSQ-73 Console Operator Course that I just completed ranks high when compared to other courses that I have previously completed," (See Appendices C and D for Student End-Of-Course Questionnaires). A summary, of the students' scores on this item, is present in Table 43 and an analysis of variance of these data is reported in Table 44.

TABLE 43
Students' Acceptance of the Course for
Experimental (E), Control (C),
Field Dependent (D), and Field Independent (I) Groups

| Groups | N | Means | Median | SD |
|---|---|---|---|---|
| E-Group | 36 | 4.444 | 4.444 | .558 |
| C-Group | 36 | 4.361 | 4.389 | .683 |
| D-Group | 36 | 4.444 | 4.500 | .607 |
| I-Group | 36 | 4.361 | 4.350 | .639 |
| D,E-Group | 18 | 4.444 | 4.500 | .664 |
| D,C-Group | 18 | 4.444 | 4.500 | .616 |
| I,E-Group | 18 | 4.444 | 4.400 | .511 |
| I,C-Group | 18 | 4.278 | 4.300 | .752 |

TABLE 44
Analysis of Variance Comparing
Students' Attitude Toward Course

| Source of Variation | Sum of Squares | Degree of Freedom | Means Square | F-Value |
|---|---|---|---|---|
| Treatment | .125 | 1 | .125 | .315 |
| Cognitive Style | .125 | 1 | .125 | .315 |
| Treatment X Cognitive Style | .125 | 1 | .125 | .315 |
| Residual | 26.944 | 68 | .396 | |

The analysis of variance of means, for the Treatment effect, the Cognitive Style effect, and Interaction effects all yielded an F-value of .315 which was not significant at the P=.576 level.

2b. Student attitude toward the SITS lessons was also used to assess student acceptance. The following question was used for data collection: "I see no reason why there should be any changes in the practical exercises of the AN/TSQ-73 Console Operator Course," (See Appendices C and D for Student End-Of-Course Questionnaire). A summary, of the students' scores on this item, is presented in Table 45 and an analysis of variance of these data is reported in Table 46.

TABLE 45
Student Attitude Toward the Practical Exercises for Experimental (E), Control (C), Field Dependent (D), and Field Independent (I) Groups

| Groups | N | Means | Median | SD |
|---|---|---|---|---|
| E-Group | 36 | 4.556 | 4.682 | .607 |
| C-Group | 36 | 3.444 | 3.563 | .877 |
| D-Group | 36 | 3.917 | 4.000 | .937 |
| I-Group | 36 | 4.083 | 4.214 | .937 |
| D,E-Group | 18 | 4.446 | 4.513 | .926 |
| D,C-Group | 18 | 3.389 | 3.357 | .916 |
| I,E-Group | 18 | 4.667 | 4.808 | .594 |
| I,C-Group | 18 | 3.500 | 3.700 | .857 |

TABLE 46
Analysis of Variance Comparing Students' Attitude Toward the Practical Exercise

| Source of Variation | Sum of Squares | Degree of Freedom | Means Square | F-Value |
|---|---|---|---|---|
| Treatment | 22.222 | 1 | 22.222 | 38.527* |
| Cognitive Style | .500 | 1 | .500 | .867 |
| Treatment X Cognitive Styel | .056 | 1 | .056 | .096 |
| Residual | 39.222 | 68 | .557 | |

*Significant at or above the .05 level.

The analysis of variance of means, comparing the experimental and control groups (Treatment), yielded an F-value of 38.527 which was significant at the P=.001 level. This finding indicates that the experimental students held a significantly more positive attitudes toward the practical exercises than did the control students. An analysis of variance of means, comparing Field Dependent and Field Independent groups (Cognitive Style), yielded an F-value of .867 which was not significant at the P=.355 level. The analysis of variance for interaction effects between the type of Treatment and the type of Cognitive Style yielded an F-value of .096 which was not significant at the P=.757 level.

2c. A third set of items were used to assess student acceptance. These items were stated as follows: (1) "I would like to take other courses that utilize the 'Student Interactive Training System,'" (See Appendix C for the Student End-Of-Course Questionnaire: Form E Experimental ); and (2) "I would like to take other courses that use practical exercises like the ones in this course," (See Appendix D for the Student End-Of-Course Questionnaire: Form C Control ).

A summary, of the subjects' scores on this item for the various groups, is presented in Table 47 and an analysis of variance of these data is reported in Table 48.

TABLE 47
Students' Willingness to Use the SITS for
Experimental (E), Control (C),
Field Dependent (D), and Field Independent (I) Groups

| Groups | N | Means | Median | SD |
|---|---|---|---|---|
| E-Group | 36 | 4.389 | 4.600 | .766 |
| C-Group | 36 | 4.194 | 4.333 | .856 |
| D-Group | 36 | 4.278 | 4.500 | .849 |
| I-Group | 36 | 4.306 | 4.500 | .786 |
| D,E-Group | 18 | 4.397 | 4.441 | .726 |
| D,C-Group | 18 | 4.167 | 4.333 | .924 |
| I,E-Group | 18 | 4.389 | 4.600 | .778 |
| I,C-Group | 18 | 3.889 | 3.944 | .832 |

TABLE 48
Analysis of Variance Comparing
Students' Willingness to Use SITS

| Source of Variation | Sum of Squares | Degree of Freedom | Means Square | F-Value |
|---|---|---|---|---|
| Treatment | .681 | 1 | .681 | 1.002 |
| Cognitive Style | .014 | 1 | .014 | .020 |
| Treatment X Cognitive Style | .014 | 1 | .014 | .020 |
| Residual | 46.167 | 68 | .679 | |

The analysis of variance of means, comparing the experimental and control groups (Treatment), yielded an F-value of 1.002 which was not significant at the P=.320 level. An analysis of variance of means, comparing Field Dependent and Field Independent groups (Cognitive Style), yielded an F-value of .020 which was not significant at the P=.887 level. The analysis of variance of means for interaction effects between the type of Treatment and the type of Cognitive Style yielded an F-value of .020 which was not significant at the P=.887 level.

2d. Two open-ended questions were also used to assess student acceptance of the SITS lessons. The questions were stated as follows: (1) "What did you like about the practical exercises in the AN/TSQ-73 Console Operator course;" and (2) "What did you dislike about the practical exercises in the AN/TSQ-73 Console Operator Course," (See Appendices C and D for Student End-Of-Course Questionnaire: Form E and Form C. Typical types of comments were as follows:

Experimental Subjects - Likes

- It helped me to better understand what I was learning.
- It helped me to find the switches when I was on the equipment.
- I would not have learned as well without the SITS.
- The SITS allowed me to spend the amount of time that I needed.

Experimental Subjects - Dislikes

- The SITS programs slowed me down.
- I could not see some of the displays on the SITS.
- Couldn't read the screens and the headphones were uncomfortable.
- Visual image kept jumping around on the screen.
- Everyone should have to go through the SITS. We had to spend more time.

Control Subjects - Likes

- The labs were most interesting.
- Labs helped to understand the lessons.
- The labs are where I got to apply the skills.
- I understood better after the labs.
- I liked working with the equipment.

Control Subjects - Dislikes

- Waiting to use a lab.
- Not having an opportunity to work on my own.
- The labs were too cold.
- They would breakdown.
- There was always a delay for the labs and I would have to just sit around.

3. Instructor Acceptance. Information about the instructors' acceptance of the SITS lesson was collected from four different sources. The findings from these sources are now presented.

3a. The evaluation attempted to assess the instructors' attitude toward the overall AN/TSQ-73 Console Operation Course. The following statement was used to gather data from students for analyzing instructor acceptance: "The AN/TSQ-73 Console Operator course ranks high when compared to other courses that I have previously taught," (See Appendix E for Instructor-End-Of-Course Questionnaire). Descriptive statistics for this item are reported in Table 49 and the frequency distribution of scores is reported in Table 50. The finding indicates that 90% of the instructors rank the course very high among other courses that they have taught. Another 10% were neutral about the issue.

TABLE 49
Descriptive Statistics for
Instructor Attitude Toward the Course

| Mean | Median Score | SD | Number of Scores | % of Acceptance | % Neutral | % of Non-Acceptance |
|---|---|---|---|---|---|---|
| 4.600 | 4.786 | .669 | 10 | 90 | 10 | 0 |

TABLE 50
Frequency Distribution for the
Data in Table 49

| Scores | Frequency (f) |
|---|---|
| 5 | 7 |
| 4 | 2 |
| 3 | 1 |
| 2 | 0 |
| 1 | 0 |
| | $\Sigma f=10$ |

3b. Another item for assessing instructor acceptance was stated as follows: "The Student Interactive Training System, was an excellent method for presenting the practical exercises to students," (See Appendix E for Instructor End-Of-Course Questionnaire). Descriptive statistics for this item are reported in Table 51 and the frequency distributions of scores is reported in Table 52. The finding indicates 90% of the instructors believed that the SITS was a good method for presenting a part of the practical exercises. Another 19% of the instructors were neutral on the issue.

TABLE 51
Descriptive Statistics for
Instructors' Attitude Toward SITS Lessons

| Mean | Median Score | SD | Number of Scores | % of Acceptance | % Neutral | % of Non-Acceptance |
|---|---|---|---|---|---|---|
| 4.100 | 4.071 | .568 | 10 | 90 | 10 | 0 |

TABLE 52
Frequency Distribution for the
Data in Table 51

| Scores | Frequency (f) |
|---|---|
| 5 | 2 |
| 4 | 7 |
| 3 | 1 |
| 2 | 0 |
| 1 | 0 |
| | $\Sigma F=10$ |

3c. Instructors were also asked to respond to the following statement: "I look forward to working with future courses that will use the Student Interactive Training System," (See Appendix E for the Instructor-End-Of-Course Questionnaire). Descriptive statistics for this item are reported in Table 53 and the frequency distribtuion is reported in Table 54. The findings indicate that 100% of the instructors were willing to work with future courses that uses the SITS.

TABLE 53
Descriptive Statistics for
Instructors' Willingness to Work With SITS

| Mean | Median Score | SD | Number of Scores | % of Acceptance | % Neutral | % of Non-Acceptance |
|---|---|---|---|---|---|---|
| 4.300 | 4.214 | .483 | 10 | 100 | 0 | 0 |

TABLE 54
Frequency Distribution for the
Data in Table 53

| Scores | Frequency (f) |
|---|---|
| 5 | 3 |
| 4 | 7 |
| 3 | 0 |
| 2 | 0 |
| 1 | 0 |
| | $\Sigma f=10$ |

3d. Two open-ended questions were used to assist in evaluating the instructors' acceptance variable. The first question was stated: "What did you like about the Student Interactive Training System?" (See Appendix E for the Instructor End-Of-Course Questionnaire). Typical responses were as follows:

- Students knew the location and function of switches before going to the lab.
- The SITS recreated an AN/TSQ-73 lab environment without tieing up the system.
- SITS assisted in providing the student with better attention to detail and a more rapid development of practical skills.
- Helped to reinforce training.

A second question was stated: "What did you dislike about the Student Interactive Training System?" (See Appendix E for the Instructor End-Of-Course Questionnaire). Typical responses were as follows:

- Course time had not been allocated to the SITS.
- It was slow and touch sensitive screen occasionally errored.
- The video was not very good.
- When the frame was frozen, a fuzzy or distorted picture was presented.

4. Program Implementation. An evaluation is always interested in attempting to determine if any variable, other than the Treatment, was affecting the program's outcomes. The manner in which a program is implemented can negatively affect the evaluation. Six items from two sources were used to assess the program implementation variable. The findings from these six items are now reported.

4a. The first item examined the orientation that students received about the SITS lessons and practical exercises. The items for the experimental and control students were stated in a slightly different manner. The experimental group's item was stated: "The introduction on how to use the 'Student Interactive Training System' was clear and helpful," (See Appendix C for Experimental Student End-Of-Course Questionnaire). The control group's item was stated: "The introduction that I received to the practical exercise portion of the course was clear and helpful," (See Appendix D for Control Student End-Of-Course Questionnaire).

A summary of the subjects' scores on these items for the various groups is presented in Table 55 and an analysis of variance of these data is reported in Table 56.

TABLE 55
Student Perception of Orientation for
Experimental (E), Control (C),
Field Dependent (D), and Field Independent (I) Groups

| Groups | N | Means | Median | SD |
|---|---|---|---|---|
| E-Group | 36 | 4.361 | 4.433 | .144 |
| C-Group | 36 | 4.194 | 4.222 | .749 |
| D-Group | 36 | 4.333 | 4.333 | .632 |
| I-Group | 36 | 4.222 | 4.300 | .797 |
| D,E-Group | 18 | 4.177 | 4.223 | .122 |
| D,C-Group | 18 | 4.500 | 4.500 | .514 |
| I,E-Group | 18 | 4.556 | 4.682 | .616 |
| I,C-Group | 18 | 3.889 | 3.944 | .832 |

TABLE 56
Analysis of Variance Comparing
Students' Perception of Orientation

| Source of Variation | Sum of Squares | Degree of Freedom | Means Square | F-Value |
|---|---|---|---|---|
| Treatment | .500 | 1 | .500 | 1.089 |
| Cognitive Style | .222 | 1 | .222 | .484 |
| Treatment X Cognitive Style | 4.500 | 1 | 4.500 | 9.801* |
| Residual | 31.222 | 68 | .459 | |

*Significant at or above the .05 level.

The analysis of variance of means comparing the experimental and control groups (Treatment), yielded an F-value of 1.089 which was not significant at the P=.156 level. An analysis of variance of means comparing Field Dependent and Field Independent groups (Cognitive Style), yielded an F-value of .300 which was not significant at the P=.484 level. The analysis of variance for interaction effects between the type of Treatment and Cognitive Style yielded an F-value of 9.801 which was significant at the P=.003 level. A post hoc analysis, using a Tukey t-test, established the following significant differences: (1) Independent Experimental subjects judged their orientation to be better than did the Independent Control subjects; and (2) Dependent Control subjects judged their orientation to be better than did Independent Control subjects.

4b. The second item that was used to assess program implementation was stated in the following two ways: (1) "The course instructors were very helpful and friendly to me during the time I was using the Student Interactive Training System," (See Appendix C for Experimental Student End-Of-Course Questionnaire); and (2) "The Course instructors were very helpful and friendly to me during the time I was in the practical exercises," (See Appendix D for Control Student End-Of-Course Questionnaire).

A summary of the subjects' scores on these items for the various groups is presented in Table 57 and an analysis of variance of these data is reported in Table 58.

TABLE 57
Student Perceived Quality of Received Assistance for Experimental (E), Control (C), Field Independent (D), and Field Independent (I) Groups

| Groups | N | Means | Median | SD |
|---|---|---|---|---|
| E-Group | 36 | 4.750 | 4.833 | .439 |
| C-Group | 36 | 4.611 | 4.750 | .599 |
| D-Group | 36 | 4.778 | 4.857 | .422 |
| I-Group | 36 | 4.583 | 4.717 | .604 |
| D,E-Group | 18 | 4.778 | 4.857 | .422 |
| D,C-Group | 18 | 4.778 | 4.857 | .428 |
| I,E-Group | 18 | 4.772 | 4.808 | .461 |
| I,C-Group | 18 | 4.444 | 4.600 | .705 |

TABLE 58
Analysis of Variance Comparing Students' Perceived Quality of Received Assistance

| Source of Variation | Sum of Squares | Degree of Freedom | Means Square | F-Value |
|---|---|---|---|---|
| Treatment | .347 | 1 | .347 | 1.292 |
| Cognitive Style | .681 | 1 | .681 | 2.532 |
| Treatment X Cognitive Style | .347 | 1 | .347 | 1.292 |
| Residual | 18.278 | 68 | .269 | |

The analysis of variance of means comparing the experimental and control groups (Treatment), yielded an F-value of 1.292 which was not significant at P=.260. An analysis of variance of means comparing Field Dependent and Field Independent groups (Cognitive Style), yielded an F-value of 2.532 which was not significant at the P=.116 level. The analysis of variance for interaction effects between the type of Treatment and the type of Cognitive Style yielded an F-value of 1.292 which was not significant at the P=.260 level.

4c. The third item used to assess program implementation was stated in the following two ways: (1) "The environment (room, temperature, noise level, etc.), in which I used the Student Interactive Training System, contributed to my learning," (See Appendix C for Experimental Student End-Of-Course Questionnaire); and (2) "The environment (room, temperature, noise level, etc.),

in which the practical exercises were held contributed to my learning," (See Appendix D for Control Student End-Of-Course Questionnaire).

A summary of the subjects' scores on these items for the various groups is presented in Table 59 and an analysis of variance of these data is reported in Table 60.

TABLE 59
Student Perception of Learning Environment for Experimental (E), Control (C), Field Dependent (D), and Field Independent (I) Groups

| Groups | N | Means | Median | SD |
|---|---|---|---|---|
| E-Group | 36 | 4.417 | 4.553 | .692 |
| C-Group | 36 | 4.278 | 4.429 | .849 |
| D-Group | 36 | 4.389 | 4.600 | .803 |
| I-Group | 36 | 4.306 | 4.375 | .749 |
| D,E-Group | 18 | 4.389 | 4.600 | .843 |
| D,C-Group | 18 | 4.389 | 4.600 | .850 |
| I,E-Group | 18 | 4.444 | 4.500 | .616 |
| I,C-Group | 18 | 4.167 | 4.250 | .857 |

TABLE 60
Analysis of Variance Comparing Students' Perception of Learning Environment

| Source of Variation | Sum of Squares | Degree of Freedom | Means Square | F-Value |
|---|---|---|---|---|
| Treatement | .347 | 1 | .347 | .569 |
| Cognitive Style | .125 | 1 | .125 | .205 |
| Treatment X Cognitive Style | .347 | 1 | .347 | .569 |
| Residual | 41.500 | 68 | .610 | |

The analysis of variance of means comparing the experimental and control groups (Treatment), yielded an F-value of .569 which was not significant at the P=.453 level. An analysis of variance of means comparing Field Dependent and Field Independent groups (Cognitive Style), yielded an F-value of .205 which was not significant at the P=.652 level. The analysis of variance for interaction effects between the type of Treatment and the type of Cognitive Style yeilded an F-value of .453 which was not significant at the P=.453 level.

4d. A fourth assessment item for the program implementation variable was stated in the two following ways: "I did not have any problems using lessons designed for the Student Interactive Training System," (See Appendix C for Experimental Student End-Of-Course Questionnaire); and "I did not have any problems with the practical exercise lessons," (See Appendix D for Control Student End-Of-Course Questionnaire).

A summary of the subjects' scores on the items for the various groups is presented in Table 61 and an analysis of variance of these data is reported in Table 62.

TABLE 61
Students' Perceived Quality of the SITS's
Lessons for Experimental (E), Control (C),
Field Dependent (D), and Field Independent (I) Groups

| Groups | N | Means | Median | SD |
|---|---|---|---|---|
| E-Group | 36 | 4.417 | 4.395 | .554 |
| C-Group | 36 | 4.306 | 4.367 | .710 |
| D-Group | 36 | 4.250 | 4.265 | .692 |
| I-Group | 36 | 4.472 | 4.500 | .560 |
| D,E-Group | 18 | 4.333 | 4.389 | .574 |
| D,C-Group | 18 | 4.167 | 4.214 | .786 |
| I,E-Group | 18 | 4.500 | 4.500 | .514 |
| I,C-Group | 18 | 4.444 | 4.500 | .616 |

TABLE 62
Analysis of Variance Comparing
Student Perceived Quality of the SIT's Lessons

| Source of Variation | Sum of Squares | Degree of Freedom | Means Square | F-Value |
|---|---|---|---|---|
| Treatment | .222 | 1 | .222 | .551 |
| Cognitive Style | .889 | 1 | .889 | 2.202 |
| Treatment X Cognitive Style | .056 | 1 | .056 | .138 |
| Residual | 27.444 | 68 | .404 | |

The analysis of variance of means comparing the experimental and control groups (Treatment), yielded an F-value of .551 which was not significant at the P=.461 level. An analysis of variance of means comparing Field Dependent and Field Independent groups (Cognitive Style), yielded an F-value of 2.202 which was not significant at the P=.142 level. The analysis of variance for interaction effects between the type of Treatment and the type of Cognitive Style yielded an F-value of .138 which was not significant at the P=.712 level.

4e. A fifth assessment item for the program implementation variable was stated in the following two ways: (1) "The training equipment used in the Student Interactive Training System, seldom created any problems for me," (See Appendix C for the Experimental Student End-Of-Course Questionnaire); and (2) "The training equipment used in the practical exercises seldom created any problems for me," (See Appendix D for the Control Student End-Of-Course Questionnaire).

A summary of the subjects' scores on the item for the various groups is presented in Table 63 and an analysis of variance of these data is reported in Table 64.

TABLE 63
Students' Perceived Quality of SITS's
Equipment for Experimental (E), Control (C),
Field Dependent (D), and Field Independent (I) Groups

| Groups | N | Means | Median | SD |
|---|---|---|---|---|
| E-Group | 36 | 4.000 | 4.000 | .717 |
| C-Group | 36 | 3.944 | 4.000 | .826 |
| D-Group | 36 | 3.861 | 3.853 | .723 |
| I-Group | 36 | 4.083 | 4.132 | .806 |
| D,E-Group | 18 | 3.781 | 3.788 | .712 |
| D,C-Group | 18 | 3.944 | 3.929 | .802 |
| I,E-Group | 18 | 4.222 | 4.250 | .732 |
| I,C-Group | 18 | 3.944 | 4.045 | .873 |

TABLE 64
Analysis of Variance Comparing
Student Perceived Quality of SITS's Equipment

| Source Of Variation | Sum of Squares | Degree of Freedom | Means Square | F-Value |
|---|---|---|---|---|
| Treatment | .056 | 1 | .056 | .094 |
| Cognitive Style | .889 | 1 | .889 | 1.507 |
| Treatment X Cognitive Style | .889 | 1 | .889 | 1.507 |
| Residual | 40.111 | 68 | .590 | |

The analysis of variance of means comparing the experimental and control groups (Treatment), yielded an F-value of .094 which was not significant at the P=.760 level. An analysis of variance of means comparing Field Dependent and Field Independent groups (Cognitive Style), yielded an F-value of 1.507 which was not significant at the P=.224 level. The analysis of variance of interaction effects between the types of Treatment and the types of Cognitive Style yielded an F-value of 1.507 which was not significant at the P=.224 level.

4f. Another item about program implementation sought information from the course instructors. The item was stated as follows: "Students were able to use the Student Interactive Training System with little instructor assistance," (See Appendix E for Instructor End-Of-Course Questionnaire). Descriptive statistics for this item are reported in Table 65 and the frequency distribution of scores is reported in Table 66.

TABLE 65
Descriptive Statistics for
Instructors' Perception of the Students' Ability
To Work With The SITS

| Mean | Median Score | SD | Number of Scores | % of Acceptance | % Neutral | % of Non-Acceptance |
|---|---|---|---|---|---|---|
| 4.100 | 4.100 | .738 | 10 | 80 | 10 | 0 |

TABLE 66
Frequency Distribution for the
Data in Table 65

| Sources | Frequency (f) |
|---|---|
| 5 | 3 |
| 4 | 5 |
| 3 | 2 |
| 2 | 0 |
| 1 | 0 |
| | $\Sigma f=10$ |

The findings indicated that 80% of the instructors thought that students were able to use the Student Interactive Training System with very little instructor assistance. Another 20% of the instructors were neutral on this item.

5. Relibility: The reliability of the SITS was a variable for assessment in the evaluation. Data for assessing reliability was collected from the student questionnaire, instructor questionnaire and the SITS Problem Log. The findings about the SITS reliability is now reported.

5a. The items used from the student sources to assess the reliability variable were stated as follows: (1) "My learning was seldom interrupted by equipment filure while using the Student Interactive Training System," (See Appendix C for the Experimental Student End-Of-Course Questionnaire); and (2) "My learning was seldom interrupted by equipment failure while I was in the practical exercises," (See Appendix D for the Control Student End-Of-Course Quesionnaire).

A summary of the subjects' scores on the items for the various groups is presented in Table 67 and an analysis of variance of these data is presented in Table 68.

TABLE 67
Students' Perception of the SITS's Reliability
for Experimental (E), Control (C),
Field Dependent (D), and Field Independent (I) Groups

| Groups | N | Means | Median | SD |
|---|---|---|---|---|
| E-Group | 36 | 4.111 | 4.083 | .575 |
| C-Group | 36 | 4.000 | 4.079 | .862 |
| D-Group | 36 | 4.000 | 4.020 | .632 |
| I-Group | 36 | 4.111 | 4.167 | .820 |
| D,E-Group | 18 | 3.945 | 3.968 | .575 |
| D,C-Group | 18 | 4.056 | 4.083 | .725 |
| I,E-Group | 18 | 4.278 | 4.227 | .575 |
| I,C-Group | 18 | 3.944 | 4.071 | .998 |

TABLE 68
Analysis of Variance Comparing
Student Perception of the SITS's Reliability

| Source of Variation | Sum of Squares | Degree of Freedom | Means Square | F-Value |
|---|---|---|---|---|
| Treatment | .222 | 1 | .222 | .415 |
| Cognitive Style | .222 | 1 | .222 | .415 |
| Treatment X Cognitive Style | .889 | 1 | .889 | 1.659 |
| Residual | 36.444 | 68 | .536 | |

The analysis of variance of means comparing the experimental and control groups (Treatment), yielded an F-value of .415 which was not significant at the P=.522 level. An analysis of variance of means comparing Field Dependent and Field Independent groups (Cognitive Style), yielded an F-value of .415 which was not significant at the P=.522 level. The analysis of variance for interaction effects between the type of Treatment and the type of Cognitive Style yielded an F-value of 1.659 which was not significant at the P=.202 level.

5b. The item used from the instructor source to assess the reliability variable was stated as follows: "The training equipment used in the Student Interactive Training System had very few problems," (See Appendix E for the

Instructor End-Of-Course Questionnaire). Descriptive statistics for this item are reported in Table 69 and the frequency distribution of scores is reported in Table 70.

TABLE 69
Descriptive Statistics for
Instructors Perception of the SITS's Reliability

| Mean | Median Score | SD | Number of Scores | % of Acceptance | % Neutral | % of Non-Acceptance |
|---|---|---|---|---|---|---|
| 4.200 | 4.167 | .632 | 10 | 90 | 10 | 0 |

TABLE 70
Frequency Distribution for the
Data in Table 69

| Scores | Frequency (f) |
|---|---|
| 5 | 3 |
| 4 | 6 |
| 3 | 1 |
| 2 | 0 |
| 1 | 0 |
| | $\Sigma f=10$ |

The findings indicated that 90% of the instructors thought that the SITS was a reliable training system. Another 10% of the instructors were neutral on the reliability of the SITS.

5c. The evaluation plan also required a recording of daily down-time, of the SITS, due to any given problem that occured (See Appendix F for SITS Problem Log). The type of problem and the number of occurrences are listed below:

| Type of Problem | # of Occurences |
|---|---|
| Touch Sensitive Screen X, Y Coordinates Out of Position | 5 |
| Dead Spot in a Portion of the Touch Sensitive Screen | 3 |
| Portion of Programs Missing From Discs | 6 |
| Video Tape Out of Sync | 1 |
| Power Switch | 1 |
| ROM Chip was Unseated | 2 |

Generally, these problems were corrected within a matter of minutes. Only one resulted in downtime that extended into another day. The instructors indicated that no actual training time was lost due to the equipment failure because they were able to either fix the problem immediately or move the students to another lesson. Complaints about the reliability of the system typically fell into three categories: (1) The poor quality of the video tapes; (2) the picture distortion that resulted when the video tape was placed on stop action frame; and (3) touch sensitive screen malfunctioning.

6. Cost Analysis: An analysis of the costs associated with the SITS portion of the AN/TSQ-73 Console Operator Training Courses is presented in this section. In addition, this section compares the cost of the SITS to the costs that would occur by increasing the number of AN/TSQ-73 labs to enable the practical exercises to be more efficiently operated.

6a. SITS Cost Analysis

Research and Development Time for the SITS.*

| Item | | | Unit Cost | Total |
|---|---|---|---|---|
| Project Manager | 8 | man-months @ | 2314/mo. | 18,512.00 |
| Course Writer/Developer | 52 | man-months @ | 1913/mo. | 99,476.00 |
| Data Entry Personnel | 3.5 | man-months @ | 1913/mo. | 6,696.00 |
| Clerical Personnel | 2 | man-months @ | 1005/mo. | 2,010.00 |
| | | | | 126,694.00 |

Material and Equipment Costs for the SITS.*

Two SITS were used in the evaluation study. However, four SITS have been figured in this analysis because only one half of the students used the SITS during the evaluation. Two additional SITS would be needed to provided a sufficient amount of equipment for an entire class.

| No. | Item | Unit Cost | Total |
|---|---|---|---|
| 4 | Student Interactive Training System** | $16,550.00 | $66,200.00 |
| 400 | Blank Discettes | 3.00 | 1,200.00 |
| 102 | Video Cassettes | 20.00 | 2,040.00 |
| | | | $69,400.00 |

*Hardware and software production and purchase costs were provided by USAADASCH personnel.

**SITS includes 1 Apple II+, 2 disc drives, 1 videotape player, 2 color monitors, expansion chassis, 2 touch-responsive bezels, associated controller, and interface card, cabinet, and table.

## Operational Costs*

| Item | | Unit Cost | Total |
|---|---|---|---|
| Course Maintenance* | 4 man-months @ | 1875/mo. | 7,500.00 |
| SITS Facilitator | 4 man-months @ | 1875/mo. | 7,500.00 |
| Repair Contract | | 1000/mo. | 12,000.00 |
| | | | 27,000.00 |

Equipment depreciation has been calculated over a ten-year period. The total cost of equipment was $69,440.00 which results in a cost of $6,944.00 per year. A cost analysis projecting cost per instructional group, using the SITS, is provided in Table 71. These calculations are based on 26 separate classes/year with an enrollment of 15 students per class. The formula for these calculations is:

$$Cg=\frac{B}{N} + O$$

where: Cg = Cost per Group
B = Basic Costs
O = Operational Costs
N = Total Number of Students

TABLE 71
Cost Per Instructional Group
for the SITS

| Year | Number of Groups | Cumulative Groups | Group Cost |
|---|---|---|---|
| 1984-85 | 26 | 26 | $1,792.19 |
| 1985-86 | 26 | 52 | $1,415.00 |
| 1986-87 | 26 | 78 | $1,289.39 |
| 1987-88 | 26 | 104 | $1,226.55 |
| 1988-89 | 26 | 130 | $1,188.84 |
| 1989-90 | 26 | 156 | $1,163.70 |
| 1990-91 | 26 | 182 | $1,145.74 |
| 1991-92 | 26 | 208 | $1,132.27 |
| 1992-93 | 26 | 234 | $1,121.80 |
| 1993-94 | 26 | 260 | $1,113.42 |

A cost analysis projecting cost per student over the next ten years has also been provided in Table 72. The formula for these calculations is:

$$Cs = \frac{B}{N} + \frac{O}{n}$$

*Courseware revision and update.

where: Cs = Cost Per Student
B = Basic Cost
O = Operational Costs
N = Total Number of Students Who Have Taken the Course (Including the Present Group)
n = Number of Students in Present Group

TABLE 72
Cost Per Student in the Last Class of Each Year for the SITS

| Year | Number of Students | Cumulative Students | Student Cost |
|---|---|---|---|
| 1984-85 | 390 | 390 | 119.48 |
| 1985-86 | 390 | 780 | 94.34 |
| 1986-87 | 390 | 1170 | 85.96 |
| 1987-88 | 390 | 1560 | 81.77 |
| 1988-89 | 390 | 1950 | 79.26 |
| 1989-90 | 390 | 2340 | 77.50 |
| 1990-91 | 390 | 2730 | 76.38 |
| 1991-92 | 390 | 3120 | 75.48 |
| 1992-93 | 390 | 3510 | 74.79 |
| 1993-94 | 390 | 3900 | 74.23 |

6b. Present Practical Exercise Cost Analysis. An analysis was made to determine the cost of adding one additional AN/TSQ-73 System to the practical exercise component. Therefore, only equipment and operation costs have been analyzed. It should be noted that actually several additional systems are probably needed, in order to reduce the extensive student waiting time.

Equipment Costs*

| No. | Item | Unit Cost | Total |
|---|---|---|---|
| 1 | An/TSQ-73 System | $2,700,000.00 | $2,700,000.00 |

Operational Costs

| Item | | Unit Cost | Total |
|---|---|---|---|
| Course Maintenance | 4 man-months @ | 1875/mo. | 7,500.00 |
| Lab Instructor | 12 man-months @ | 1875/mo. | 22,500.00 |
| | | 106,000/year | 106,000.00 |
| | | | 136,000.00 |

*Cost figures were provided by USAADASCH personnel.

Equipment depreciation has been calculated over a ten-year period. The total cost of equipment was estimated at $2,700,000.00* which results in a cost of $270,000 per year. A cost analysis projecting cost per instructional group is provided in Table 73. These calculations are based on 26 separate classes with an enrollment of 15 students per class.

TABLE 73
Cost Per Student Group
for Adding Equipment to the Present Instructional Approach

| Year | Number of Groups | Cumulative Groups | Group Cost |
|---|---|---|---|
| 1984-85 | 26 | 26 | 15,615.38 |
| 1985-86 | 26 | 52 | 10,423.07 |
| 1986-87 | 26 | 78 | 8,692.30 |
| 1987-88 | 26 | 104 | 7,826.91 |
| 1988-89 | 26 | 130 | 7,307.68 |
| 1989-90 | 26 | 156 | 6,961.53 |
| 1990-91 | 26 | 182 | 6,714.28 |
| 1991-92 | 26 | 208 | 6,528.84 |
| 1992-93 | 26 | 234 | 6,384.61 |
| 1993-94 | 26 | 260 | 6,269.22 |

An analysis projecting cost per student over the next ten years has also been provided in Table 74.

TABLE 74
Cost Per Student in the Last
Class of Each Year for the Present Instructional Approach

| Year | Number of Students | Cumulative Students | Student Cost |
|---|---|---|---|
| 1984-85 | 390 | 390 | 1041.03 |
| 1985-86 | 390 | 780 | 694.87 |
| 1986-87 | 390 | 1170 | 579.49 |
| 1987-88 | 390 | 1560 | 521.80 |
| 1988-89 | 390 | 1950 | 487.18 |
| 1989-90 | 390 | 2340 | 464.10 |
| 1990-91 | 390 | 2730 | 447.62 |
| 1991-92 | 390 | 3120 | 435.26 |
| 1992-93 | 390 | 3510 | 425.64 |
| 1993-94 | 390 | 3900 | 417.95 |

*Cost figures were provided by USAADASCH personnel.

## SUMMARY/CONCLUSION

The evaluation concentrated on documenting outcomes and, to some extent, activities in several basic areas of inquiry. The evaluation requests specifically sought to examine the following questions as they related to the Student Interactive Training System (SITS).

1. Will students using the SITS be able to obtain a statistically comparative performance rating as those using current methods?

2. Will students using the SITS be able to obtain a comparative skill performance with reduced end item equipment exposure?

3. Will students using the SITS be able to complete training in a time statistically comparative to those learning by current methods?

4. Will students using the SITS indicate an acceptance/non-acceptance of the training methodology?

5. Will instructors/course managers of the SITS indicate an acceptance/non-acceptance of the training methodology?

6. What will be the comparison of student confidence with acquired skills of those trained on the SITS and those trained by current methods?

The evaluation also examined the effect that the SITS had on students with different types of cognitive style. Cognitive Style was measured by Herman Witkin's, Group Embedded Figures Test. Students were determined to be either "Field Dependent" or "Field Independent" learners.

The evaluation design used the following six variables in an attempt to seek answers to the above questions: (1) effectiveness, (2) student acceptance, (3) instructor acceptance, (4) program implementation, (5) reliability, and (6) cost analysis. A summary and conclusion for each of these variables is now reported.

### Effectiveness:

It is evident that the SITS had a positive impact on cognitive skill achievement. Students that received instruction from the SITS scored significantly higher on three of the nine cognitive tests that were used in the course. One of these tests was a 75 question end-of-course examination. The experimental (SITS) students did at least as well as the control (current method) students on the other six cognitive tests. These findings suggest that the experimental students were integrating learning from the SITS with other course segments. This integration resulted in a more effective transfer of learning by the SITS students. Cognitive achievement was determined to be significantly higher for field independent students than for field dependent students on two of the written tests. These findings indicate that field independent students performed significantly better than field dependent students regardless of treatment. One can speculate that the course content,

measured by these two tests, was more interesting to the field independent students. Since the content was more interesting to them, they may have attended more thoughtfully to the instruction.

Skill transfer to actual performance was also positive for students using the SITS. The experimental students performed significantly better on two practical examinations than did the control students. This indicates that students were able to make a transfer of learning from the SITS to their performance on the actual equipment.

Speed of skill acquisition as measured by the amount of time spent in the practical exercises and the amount of time needed to complete the course was also a positive factor for the SITS students. The experimental students used a significantly less amount of time on actual equipment than did the control students. This finding provides major support for the future use of the SITS. The evaluation indicates that the amount of actual equipment time needed by students can be reduced through utilizing the SITS lessons. A significant finding was also found in favor of the experimental students in regards to the total course completion time. However, as indicated in an earlier section of this report, the SITS time was not calculated as part of the total course time. When this time was added, the experimental student spent 7 hours and 5 minutes longer than did the control student. The evaluator suggests that this time is not relevant to the management of the course, because students spend more than this amount of time waiting for a chance to use the actual equipment.

Students in the experimental group also rated the instruction that they received significantly higher than did the control group on the following: (1) speed of skill acquitision, (2) confidence in learning, and (3) transfer of learning. These findings suggest that the experimental students believe that the SITS is an effective method from which to learn. In addition, these findings are supported by the instructors of the course.

In summary, the SITS proved to be a highly effective instructional system. A number of measurements of effectiveness indicated a level of effectiveness that was significantly higher for the SITS. On the other measurements, the SITS students scored at least as well as the control students. The learner's cognitive style did not appear to have an interaction effect with the type of treatment that was received.

Student Acceptance:

The pattern of results about the analysis of student attitude toward the SITS demonstrates a favorable affective reaction. The experimental students rated the practical exercises significantly higher than did the control students. It apppears that the experimental students were more aware of what they were to do and therefore, less fearful about performing the practical exercises. This would perhaps be expected since they had already had a simulated experience with the SITS. The other student acceptance measurements indicated no significant difference between the SITS and the conventional approach. It should also be noted that the learners' cognitive style did not appear to have an effect on the student acceptance of the type of instructional methodologies used in this evaluation. The students' major criticism of the SITS

was centered around the poor quality of the video tapes. As indicated earlier in this report, the video tapes were prototype materials. They were far from being of professional quality. Also, the students felt that they had to wait too long for the video tape to advance to the correct position. If these two problems were corrected, student acceptance would probably be even higher.

In summary, students readily accepted the SITS as an instructional methodology. Findings from this evaluation suggest that students willingly received instruction willingly from the SITS.

Instructor Acceptance:

In general, the instructors also indicated a high level of acceptance for the SITS. The criticisms that instructors cited about the SITS were the same as the ones provided by the students. It is believed that, by correcting the video quality and the speed of the video retrieval, instructors will quickly incorporate the SITS into their working environment.

Program Implementation:

Program implementation appears to have been carried out in a reasonably successful manner. Only one measurement indicated any significant difference. This significant difference was an interaction effect between the treatment and the cognitive style of the learner. The independent experimental students judged their orientation to be better than did the independent control subjects and the dependent control subjects judged their orientation to be better than did the independent control subjects. Other than this one finding, there were no other significant differences among students' perception about the program implementation variable.

Instructors also tended to suggest that program implementation went fairly smooth. It was, however, reported by some instructors that they received several negative comments from SITS students. These negative comments occurred because some SITS students felt that, by going through the SITS lessons, they were having to do more than the control students. They therefore, viewed the SITS as a form of punishment. Other than this factor, program implementation did not appear to have any positive or negative effect on the final outcome.

Reliability:

The reliability of the SITS hardware and software was reasonably good. The amount of down time for the SITS was rather marginal. Any problem that occurred appeared to be fixed in minimum time. The two factors cited earlier about video quality and video retrieval should also be cited in this section.

In summary, the general reliability of the SITS's hardware and software proved to be good. Some recommendations for changes in hardware and software are presented in a later section of this report. The recommended changes should increase the reliability factor of the SITS.

Cost Analysis:

A cost analysis for four SITS was presented. As indicated, four units would be needed to provide a sufficient amount of equipment for an entire class. During the evaluation, only one half of the class used the SITS while the other half served as the control subjects. The cost analysis figures for the SITS are relatively low when one compares them to the cost of adding another AN/TSQ-73 system to the training program. It should also be noted that increasing the actual equipment by one unit would not totally reduce the long waiting lines. In addition, students would still need to attend the practical exercises in groups of three to four students. This arrangement does not provide an adequate amount of one-on-one student/machine interaction. The SITS on the other hand permits each and every student to spend as much time, in a simulated environment, as they individually need. Also, this type of experience has proven to be successful in significantly reducing the amount of training time. The cost analysis indicates that the SITS is an economically effective alternative to the current methodologies.

Summary:

It can be concluded that the SITS received a positive outcome in relationship to the six evaluation questions. In fact, the SITS exceeded the developer expectations in several areas. The SITS can be considered to be a valuable application of instructional technology and should be considered as an alternative method for providing practical exercise experiences in the AN/TSQ-73 Console Operation Course.

## RECOMMENDATIONS

The SITS did indeed meet its objectives. As previously indicated, a positive response was received for each of the six evaluation questions. However, every instructional development project should be viewed as an iterative process. The following recommendations are therefore presented for the developer future consideration:

1. The staff should continue to view the SITS as a complementary activity to the actual hands-on activities. It would probably be a mistake, to think that the entire practical exercise component of the AN/TSQ-73 Console Operator Course, could be conducted through SITS lessons. The main objective for the SITS was to complement the practical exercises, not to replace them.

2. It is recommended that new video tapes be produced by professional video personnel. The prototype videotapes were adequate; however, professionally developed tapes would provide the quality that is now missing. The enhanced video quality would remove, most if not all, the distorted images that are now evident in the present tapes.

3. The staff should consider adapting the SITS so that it employs a videodisc player rather than a videotape player. Video retrieval would be much faster with the video-disc than is presently available with the videotape system. In addition, the videodisc would reduce the amount of distortion that results when a still frame is required.

4. It is recommended that the SITS be placed in the same general area housing the other computer training equipment that is used in the AN/TSQ-73 Console Operator Course. The SITS should become an integrated part of the total training program. Students and instructors would soon view the SITS as "just another part" of the entire course.

5. The SITS has proven to be successful in this training situation. Therefore, the staff should study other areas in which the SITS might make a contribution to the training process.

# APPENDIX A

# WRITTEN TESTS

1. Using TM 9-1430-652-10-3 as an example the (652) is the subject type, it can range from ---- to ----?

   A. 040-652
   B. 652-700
   C. 650-674
   D. 000-999

2. Each AN/TSQ-73 System contains two (2) consoles, how many may be added?

   A. 12
   B. 64
   C. 8
   D. 6

3. Which subfunction within the battalion AN/TSQ-73 processes radar information?

   A. ADPE
   B. RIE
   C. ADL
   D. MTU

4. What is the purpose of the group TSQ-73 System?

   A. Coordinate Battery Operations
   B. Coordinate Battalion Operations
   C. Manage Battery Supplies
   D. Assigns missiles to Fire Units

5. How many local radars are used with a group AN/TSQ-73 System?

   A. 1
   B. 2
   C. 0
   D. 3

6. How many batteries does a IHAWK Battalion normally consist of?

   A. 2
   B. 3
   C. 4
   D. 5

7. A diagram consisting of symbols and connecting lines that show a step by step progression through a usually complicated procedure is called?

   A. A flow chart
   B. A grid chart
   C. A loop test chart
   D. A puzzle game

8. Which radar is used to track targets in the hercules battery?

   A. HIPAR
   B. TRR
   C. TTR
   D. LOPAR

9. A basic standard of flow charts is that they are read from ----- to ----- and ----- to -----?

   A. Right to Left and Top to Bottom
   B. Left to Right and Top to Bottom
   C. Left to Right and Bottom to Top
   D. Right to Left and Bottom to Top

10. The "MTS" is used to perform what function within the TSQ-73 System?

   A. Load tape data into memory.
   B. Store data for later use.
   C. Locate faulty cards.
   D. Record new data.

11. Which symbol below is a process symbol used in flow charting?

   A. =
   B. =
   C. =
   D. =

12. Targets are assigned by the?

   A. Local Radar
   B. AN/TSQ-73 Operator
   C. Generator Operator
   D. Maintenance Man

13. What do the letters M&D stand for?

   A. Mode Designator
   B. Manuals and Documents
   C. Maintenance and Diagnostic
   D. Most Significant Digit

14. The AN/TSQ-73 System is a transportable piece of equipment?

   A. False
   B. True

15. The letters "RAMIT" indicate what?

   A. Rate Aided Manually Interrogated Track.
   B. Raid Aided Manually Initiated Track.
   C. Rate Aided Manually Initiated Track.
   D. Raid Aided Manually Interrogated Track.

16. What is the method of firing called, when shooting one missile after another at the same target?

A. Shoot-Look-Shoot Method
B. Ripple Fire
C. Ready Engagement Method
D. None of the above

17. How many DDG's are located with the group AN/TSQ-73 System?

A. One
B. Three
C. Four
D. Two

18. The ADP has 8 memory units for a total of ----- words of memory?

A. 32K
B. 64K
C. 128K
D. 24K

19. In flow charting the decision block looks like?

A. Triangle
B. Square
C. Diamond
D. Circle

20. A numbering system which has a base of sixteen symbols and letters is called?

A. Hexadecimal
B. Binary
C. Bit
D. Byte

21. This symbol is called a ----- and tells you to -----?

A. Decision symbol, do something
B. Manual operations symbol, begin something
C. Manual operations symbol, do something
D. Entry Point symbol, do something

22. Which of the following publications would be used for the removal and replacement of the ADPE subassemblies?

A. TM 9-1430-655-20-6
B. TM 9-1430-655-20-5
C. TM 9-1430-655-20-8
D. TM 9-1430-655-20-4

23. In technical publications flow charts are listed in the?

A. List of Tables
B. Table of Contents
C. List of Illustrations
D. List of Flowcharts

24. The power cabinet is divided into three main areas which are?

A. Power Transfer Unit, Air Conditioner Controls, Data Communication Power Supplies.
B. AC Relay Panel, DC Circuit Breaker Panel, Power Transfer Unit.
C. Display Equipment, RIE Power, Voice Communication Filters.
D. AC Relay Panel, Patch Panel, Power Panel.

25. What part of the following publication code refers to the type of publication?

A. TM
B. 9
C. 1430
D. 652

26. What category of publications are used for equipment operations?

A. Operator/Crew -10
B. Organizational Maintenance -20
C. Direction Support Maintenance -30
D. General Maintenance -40

27. Which of the following is not a function of the Battalion AN/TSQ-7[illegible].

A. Assign Fire Unit (FU)
B. Determine if track is hostile
C. Launch a Missile
D. Detect tracks

28. When you see the abbreviation "EOT" this means what?

A. End of time
B. End of recorded data time
C. Equipment order table
D. End of tape

29. How many modems are currently in the BN. AN/TSQ-73 Systems?

A. 20
B. 12
C. 24
D. 32

30. How many VCS's can be connected to a BN. AN/TSQ-73?

A. 10, two wall stations and one for each console.
B. 4, two wall stations and one for each console.
C. 2, two wall stations.
D. 8, one for each console.

31. The modular collective protective equipment serves what function?

A. Cools equipment when air conditioner is not operational.
B. Collects all outgoing communications and codes the messages before transmission.
C. Tests suspected faulty modems.
D. Filters out gas particles in a NBC environment.

32. Alphanumerics are made up of?

A. Numbers only
B. Letters and Numbers
C. Letters only
D. Symbols

33. Once the computer in the "ICC" has processed the target information where is the data next sent?

A. ICWAR
B. IBCC
C. IPAR
D. IROR

34. The letters "CPU" indicate what?

A. Command Processing Unit
B. Central Processing Unit
C. Central Programming Unit
D. Command Programming Unit

35. The abbreviation for the work parameter is?

A. PARAM
B. PAR
C. PAM
D. PAMRA

1. Which operational configuration is used at the Battalion level?

   A. CC20
   B. CC21
   C. CC23
   D. CC75

2. What is the first step required to correct a keyboard entry error on a VCS?

   A. Press Desired Net
   B. Press Enquiry
   C. Press KBD Clear
   D. Press REL

3. Which command code is used to assign a data link to a modem?

   A. CC102
   B. CC112
   C. CC111
   D. CC131

4. Following hardware initialization, which ADP Panel Switch will remain off?

   A. IOX1
   B. IOX2
   C. IOX3
   D. IOM

5. TADIL-B is always assigned to link number ------.

   A. 32
   B. 17
   C. 0
   D. 3

6. Which of the following is used to control power to the modems?

   A. Comm Demarkation Panel.
   B. Modem Control Panel.
   C. Data Comm Panel.
   D. RIE 1 Panel.

7. Which of the following software functions is used to generate a site adapted tape?

   A. BOCP
   B. M&D
   C. SIM
   D. SSP

8. The function of a modem is to:

   A. Control power to the DC/DC Converters.
   B. Convert digital data into audio tones for radio transmission.
   C. Convert audio tones into digital data for the ADPE.
   D. Both B and C.

9. Which TM is used to define the CC Commands used by the ADPE?

   A. TM 10-3
   B. TM 10-4
   C. TM 10-6
   D. TM 10-2

10. Which of the following is the correct format definition for CC01?

   A. CC01 (ALT) (POS) (T)
   B. CC01 (T) (ALT) (POS)
   C. CC01 (POS) (ALT) (T)
   D. CC01 (ALT) (T) (POS)

11. The AUX 5V Monitor Switch is located on the ----- Panel?

   A. Radar Simulator Panel
   B. Main Power Panel
   C. RIE 2 Panel
   D. ADP Panel

12. When bypassing a failed modem, what action is required if the patch panel is not to be used?

   A. Faulty modem is turned ON.
   B. Link number must be changed.
   C. Outside cable must be moved.
   D. Link must remain OFF.

13. The modems are activated (Turned On):

   A. Manually, by the operator.
   B. Automatically, by the computer.
   C. By the CC100 Command
   D. By the CC101 Command.

14. Which of the following software functions is used to detect faults?

   A. BOCP
   B. M&D
   C. SIM
   D. SSP

15. The AN/TSQ-73 System:

   A. Must be boot loaded from the upper magnetic tape unit (MTU).
   B. Must be boot loaded from the lower magnetic tape unit (MTU).
   C. Can not be boot loaded from either MTU.
   D. Can be boot loaded from either upper or lower MTU.

16. The following command code does what? CC102-0-1.

A. Assigns ATMS to Modem 1.
B. Assigns Group to Modem 1.
C. Assigns other services to Modem 1.
D. Assigns Modem 1 to the Group.

17. The AN/TSQ-73 System has the capability to expand to ------- Modems?

A. 32
B. 46
C. 36
D. 28

18. Which Battalion configuration is used for maximum track capacity?

A. CC20
B. CC27
C. CC24
D. CC25

19. Which command code is used to run the fault isolation on the Keyboard Printer Unit (KPU)?

A. CC50
B. CC51
C. CC52
D. CC53

20. All computer commands are in the ----- numbering system?

A. Decimal
B. Hexadecimal
C. Octal
D. Binary

21. Which CC Command is formated correctly?

A. CC102 G 40 10 10 N 120 40 20 W
B. CC104 C MLU 20
C. CC102 50 48
D. CC100 98

22. What links are available for assignment at a group AN/TSQ-73?

a. Links 0 thru 20 Octal
B. Links 1 thru 12 Octal
C. Links 10 thru 32 Octal
D. Links 12 thru 17 Octal

23. To Deactivate Data Link 21, which command code would be used?

A. CC100-21
B. CC101-21
D. CC102-21
D. CC100-30

24. Which group configurations are used with one memory bank down?

A. CC21 and CC22
B. CC23 and CC26
C. CC25 and CC26
D. CC30 and CC21

25. To bypass a failed modem, which device would be used?

A. COMM Patch Panel
B. COMM Demarkation Panel
C. Data COMM Panel
D. ADP Panel

26. Which of the following devices provides the capability to communicate with many subscribers simultaneously?

A. VCC
B. VCS
C. COMM Patch Panel
D. A/N Keyboard

27. How many modems does the current Battalion system have?

A. 21
B. 22
C. 20
D. 25

28. To select the type of signal, signal strength, and bit rate for data communications which device would be used?

A. Modem Control Panel
B. Communications Demarkation Panel
C. Data COMM Panel
D. Video Processor

29. What position would the bit rate-BPS switch be set on a modem that is linked to an ATDL-1 Fire Unit?

A. 600
B. 1200
C. 750
D. 1500

30. Which technical manual should be used as a reference for command code format and contents?

A. TM 9-1430-652-10-1
B. TM 9-1430-652-10-2
C. TM 9-1430-652-10-6
D. TM 9-1430-652-10-4

31. Fault isolation programs are CC ----- through CC -----.

A. 34-40
B. 50-56
C. 30-33
D. 21-27

32. What is the last step required to complete system initialization for A BN. AN/TSQ-73 System?

A. ADPE Checkout
B. RIE Alignment
C. Hardware Initialization
D. Preliminary Switch Settings

33. To how many modems does one modem power supply provide power?

A. 4
B. 8
C. 20
D. 32

34. Which technical manual should be used as a reference when performing initialization and operating procedures?

A. TM 9-1430-652-10-3
B. TM 9-1430-652-10-1
C. TM 9-1430-652-10-2
D. TM 9-1430-560-12

35. The following command has been entered: CC102 15 14. Which answer describes the results of this command?

A. Link 15 has been assigned to Modem 14.
B. Modem 15 has been turned ON.
C. Modem 15 identifies Fire Unit 15.
D. Link 14 has been assigned to Modem 15.

36. Control commands can be entered from?

A. The KPU only.
B. The KPU, ADP Panel, or Display Console.
C. The Display Console only.
D. The ADP Panel only.

37. What is the purpose of Computer Command CC100?

A. for MAP Generation
B. To activate a logical device or data link.
C. To deactivate a logical device or data link.
D. For site adaptation only.

38. Refer to TM 9-1430-652-10-3. What position will the AC/DC conversion switches be in after power turn on? (No remote displays are connected).

A. Both ON.
B. Both OFF.
C. No. 2 ON and No. 1 OFF.
D. No. 1 ON and No. 2 OFF.

39. CC24 and CC27 are valid when the AN/TSQ-73 is operating in the ----- configuration.

A. Battalion
B. Battery
C. Group
D. Brigade

40. One VCS is located in each of the display consoles, that makes a total of five in each shelter.

A. True
B. False

41. How many modems does the current group AN/TSQ-73 System have?

A. 13
B. 15
C. 12
D. 10

42. Which switch is set on during preliminary switch settings?

A. Air conditioner circuit breaker.
B. Radar simulator antenna direction.
C. ADP power switch.
D. Voice comm central power switch.

43. How are the data links numbered?

A. Decimal (0 thru 9)
B. Octal (0 thru 37)
C. Binary (0 and 1)
D. Hexidecimal (0 thru 16)

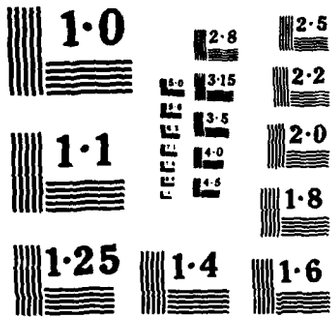
44. Which of the following configurations will allow use of the field utilities?

A. CC24
B. CC25
C. CC26
D. CC27

45. To connect a subscriber to a net, what is the first action taken?

A. Press Enquiry
B. Press Con
C. Press Desired Net
D. Press KBD Clear

AN EVALUATION OF THE STUDENT INTERACTIVE TRAINING SYSTEM AT THE US ARMY AIR DEFENSE SCHOOL(U) BATTELLE COLUMBUS LABS OH G L HULL 30 MAR 84 TR-84-2

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46. Which TM should be used as a reference when setting up a modem for ATDL-1 messages?

A. TM 9-1430-652-10-4
B. TM 9-1430-655-10-3
C. TM 9-1430-655-10-4
D. TM 9-1430-652-10-1

47. During ADP checkout which switch should be set to (PROT) to avoid accidental tape erasures?

A. Cartridge Protect
B. IOX1
C. KPU Off Line
D. MTU Address 1

48. In order to assign link 10 to modem 11 which CC command would be used?

A. CC107 10 11
B. CC102 11 10
C. CC101 10 11
D. CC102 10 11

49. Which program configurations are used for BOCP?

A. CC20 thru CC27
B. CC54 thru CC57
C. CC24 thru CC27
D. CC50 thru CC54

50. To terminate an auxiliary function which CC command would be used?

A. CC16
B. CC12
C. CC13
D. CC17

1. When bringing up a raid what panel switches must be set?

   A. VCC Main Panel
   B. DDG Status Panel
   C. RIE 1 and 2 Panel
   D. ADP Primary Control Panel

2. What does the letters "MCPE" stand for?

   A. Modular Collective Protection Equipment.
   B. Missile Control Pulse Equipment
   C. Moving Coordinator Processing Equipment
   D. Magnetic Collection Program Equipment

3. The DDG is capable of displaying summary information on how many assigned fire units?

   A. 12
   B. 20
   C. 24
   D. 32

4. Which of the following display console operations can be performed during the monitor mode?

   A. Display Tracks
   B. Display Background Data
   C. Display Fire Unit Data in the ARO
   D. All of the above.

5. Defended point designators are single alpha characters, that are denoted by?

   A. A-Z
   B. A-J
   C. K-V
   D. A-V

6. The data separation fields of the "ARO" are identified by which of the following?

   A. !!
   B. "="
   C. //
   D. "*"

7. "ECM" Symbols may be used to represent?

   A. The known location of an "ECM" source.
   B. The theoretical location of an "ECM" source.
   C. Only a feature of the system, not used.
   D. Both A and B are correct.

8. The shift key on the console AN keyboard is -----.

   A. A momentary press switch.
   B. A two position switch.
   C. Pressed in for letters.
   D. Used to send the command code.

9. A data mile equals 2000 yards; therefore seven data miles equals?

   A. 14000 yards.
   B. 1400 yards.
   C. 9000 yards.
   D. 900 yards.

10. The data selected for display in the summary data field of the "ARO" is selected by?

   A. Computer Commands
   B. Operator Switch Actions
   C. ADP Control Panel Switch Settings
   D. RIE 1 Panel Switch Settings

11. Which of the following track numbers is an ATDL-1 Track Number?

   A. AB-146
   B. 5246
   C. AC234
   D. 8700

12. When turning on the power to the system the "BITE" switch is in what position?

   A. Off
   B. Off Line
   C. On Line
   D. Inhibit

13. In the hooked track data Row 1 Column 47 the character "E" stands for which of the following?

   A. Engage
   B. Effective
   C. Estimated Height
   D. Emergency Tell

14. In Row 7 Columns 57-64 of the Status Data ARO, the message "DUPE IN" appears this means to the operator?

   A. To drop that track.
   B. To drop that fire unit.
   C. Duplicate track in system.
   D. Duplicate fire unit in system.

15. All air defense symbols have an associated alphanumeric data block.

    A. False
    B. True

16. In Row 7 Columns 57-64 what action causes a readout to appear in these columns?

    A. Action Management Messages
    B. Alert Messages
    C. Illegal Actions
    D. Fire Unit Actions

17. What is a Jam Strobe?

    A. A line that extends outward from the center of the track symbol.
    B. A straight line originating at the site or track being jammed that extends downward about an inch.
    C. A straight line originating at the site or track being jammed and extending through the jamming source to the edge of the display.

18. The summary data field of the ARO contains data on?

    A. Fire Unit Status.
    B. Jam Strobes
    C. Filter Data
    D. All of the above.

19. On which RIE Panel is the power control located?

    A. RIE 1 Panel.
    B. RIE 2 Panel.

20. What is the highest priority that can be assigned to a defended point?

    A. 3
    B. 2
    C. 5
    D. 1

21. When patching around a failed modem you would?

    A. Plug cord from Mon. to Int.
    B. Go from Int. of good modem to Ext. of failed modem.
    C. Go from Ext. of good modem to Int. of failed modem.
    D. Tell somebody about it.

22. To see how many high threat tracks are in the system you would check?

    A. ARO Row 5 Columns 52-55.
    B. ARO Row 6 Columns 52-55.
    C. ARO Row 6 Columns 56-57.
    D. ARO Row 4 Columns 52-55.

23. To find the cold missile count in the fire unit status data in the ARO you would look in columns?

A. 22-24
B. 21-23
C. 23-24
D. 23-35

24. Into how many main areas is the data display group (DDG) divided?

A. 5
B. 3
C. 2
D. 4

25. The "ARO" displays a total of 512 alphanumeric characters comprised of ----- rows and ----- columns?

A. 8 Rows and 63 Columns
B. 7 Rows and 64 Columns
C. 8 Rows and 64 Columns
D. 7 Rows and 64 Columns

26. Which of the following represents a TADIL-B track number?

A. 2093
B. AC21
C. 2477
D. 2497

27. The alert status code of "RL" indicates?

A. Responsible
B. Released
C. Reliability
D. Remote Link

28. The hooked item data field is displayed in the "ARO" between columns ----- and -----?

A. 25 and 52
B. 25 and 65
C. 27 and 49
D. 26 and 28

29. What is the radius of this defended point? "A15--"

A. 150 data miles
B. 1500 data miles
C. 15 data miles
D. 1.5 data miles

30. Which of the following tasks cannot be performed in the test mode?

A. Display Alinement
B. Offset Display
C. Check Symbol Accuracy
D. Check Symbol Brightness

31. Data to be displayed in the summary data field is selected by?

A. ARO Data Selection Switches
B. ARO Video Selection Switches
C. ARO Summary Data Switches
D. ARO Amplifying Data Switches

32. To find the ATDL-1 Track Number of the highest priority unassigned hostile threat you would look in the ARO at Row ---- Columns ----?

A. 2--57-59
B. 3--57-62
C. 1--63-64
D. 2--60-64

33. What is the main function of the data display group (DDG)?

A. Display Radar and Simulated Video.
B. Display System Status and Fire Unit Data.
C. Display Hostile Tracks.
D. None of the above.

34. What is the track number of the following track? -----AC073-----.

A. AC0
B. AC073
C. 073
D. AC07

35. Which group of controls is used to adjust the brightness of a symbol or video display?

A. Background Data Controls
B. Brightness Controls
C. Track Data Controls
D. Video and ARO Controls

36. To display the results of IFF Interrogations when the AN/TSQ-73 System is in the Beacon Tracking Mode, the operator must select?

A. ARO Data Selections- All FU
B. Video Selections - IFF/SIF
C. ARO Data Selections - Filter Data
D. Task Selections - Track Data

37. What is the main function of the AN/TSQ-73 Display Equipment?

A. Provide an interface between the operator and the TSQ-73 System.
B. Provide a machine to machine interface.
C. Provide data on speeding aircraft.
D. Provide a man to man interface.

38. How may a track number be changed once it is assigned?

A. Fire Unit Order
B. Group Order
C. Manual Intervention
D. Cannot be changed.

39. During preliminary control settings the IOX3 Switch is set to what position?

A. Off Line
B. FI Inhibit
C. On Line
D. Stop

40. Which of the following is displayed on the console PPI?

A. Hooked Item Data
B. System Status Data
C. Summary Data ARO
D. Radar Video

41. What position should the Memory 1 and Memory 2 Switches on the RIE 2 Panel be in prior to turning on the power switch?

A. Off-Line
B. Off
C. On-Line
D. On

42. The first thing you do when activating a TADIL-B Link is to?

A. Set modem to correct format.
B. Initialize data link.
C. Assign link to modem.
D. Determine link to be used.

43. In the hooked fire unit ARO Row 3 Columns 30-31 the letters "AC" appeared, this would mean to the operator?

A. Some action needs to be taken.
B. Nothing, not defined characters.
C. Fire unit is in trouble.
D. Fire unit is about to fire a missile.

44. Which of the following is a valid switch action in the tracking mode?

A. Weapons Tight
B. Weapons Free
C. Initiate Tracks
D. Cease Engagement

45. During an "ADP" checkout, the on-line indicator on the MTU stays on when rewinding the tape?

A. True
B. False
C. RIE 2 Panel
D. ADP Panel

46. If a fire unit is also designated as a defended point, will the defended point symbol be displayed?

A. Yes
B. No

47. Which of the following TM's describes the console alert index?

A. TM 9-1430-652-12
B. TM 9-1430-652-10-1
C. TM 9-1430-652-10-3
D. TM 9-1430-562-10-1

48. To display information for all reported Jam Strobes by reporting source the operator must select?

A. ARO Data Selections - All FU
B. Video Selections - IFF/SIF
C. ARO Data Selections - Jam by reporting source
D. Task Selections - Track Data

49. Which of the following functions are valid in the tracking mode?

A. Update
B. Seq Hook
C. Clear Alert
D. All of the above

50. Which system alert can be present in the tracking mode of operation?

A. Illegal Pair
B. Action Reqd
C. Attn Reqd
D. All of the above

1. When designating maps for display what happens after you press task functions "Desig Map 1"?

   A. MTU searches for map and loads it into memory.
   B. Map is displayed on DDG.
   C. KPU prints name of map.
   D. All of the above.

2. Which manual is used to find a description of G-Sensitivity Calculation?

   A. 10-5
   B. 10-4
   C. 10-3
   D. 10-2

3. What is the system G-Sensitivity Default Value?

   A. 1
   B. 3
   C. 2
   D. 5

4. To display "Normal" video on the PPI Area of the CRT, the console operator must:

   A. Adjust the normal video brightness thumbwheel for a display brightness of 9.
   B . Press the video selection normal video.
   C. Disable the video selection proc (Processed).

5. The interrogate mode switch under "Target Proc Param" is used to set an IFF mode to be used by?

   A. The Beacon Tracking Mode
   B. The Radar Tracking Mode
   C. The MTI Video Mode
   D. The Special Video Tracking Mode

6. Under the task selection option of Q:73 Remote Radar, the subord fus task function switch will be used by?

   A. Group only.
   B. BN only.

7. If located at A Lattalion AN/TSQ-73, the ---------- switch is pressed to display tracks originating at the DAR (Defense Acquisition Radar).

   A. Local Manual - Unknown
   B. Local Auto - Unknown
   C. Q-73 RR - Unknown
   D. Other Serv - Unknown

8. Which of the following is a correct entry for a speed limit filter setting for 550 data miles per hour to 750 data miles per hour?

   A. 550750
   B. 055 075
   C. 075 055
   D. 750550

9. To display data for all fire units of a designated status the operater must?

   A. Enter the status designator on the AN/Keyboard and press ARO Data Selections FU by Stat.
   B. Enter the Battalion Designator on the AN/Keyboard and Press ARO Data Selections FU by BN.
   C. Press ARO Data Selections All FU.

10. What is the maximum number of maps that can be stored on a system tape?

   A. 12
   B. 11
   C. 10
   D. 13

11. When a console filter is entered on console address "0" will it filter tracks on console address "1"?

   A. Yes
   B. No

12. What will cause an "Illegal Action" "Ill Sect"?

   A. Operator attempted to enter an invalid manual clutter sector.
   B. RIE is Off-Line.
   C. System tape is dismounted.
   D. System is not configured.

13. When designating FU's by BN what must be hooked?

   A. All FU's
   B. Command Post
   C. Own Site
   D. Nothing

14. When displaying background data showing 10-mile range marks, every ------ ring is intensified in brightness.

   A. Second
   B. Third
   C. Fourth
   D. Fifth

15. What is the limit for a manual clutter sector?

A. 15 degrees
B. 45 degrees
C. 90 degrees
D. 180 degrees

16. The use of velocity vectors will indicate the speed and heading of a track. A vector length of one inch represents ----------.

A. 1,800 data miles per hour.
B. 180 data miles per hour.
C. 18,000 data miles per hour
D. 18 data miles per hour.

17. Which switch is used to adjust the brightness of track symbology on the PPI?

A. Symbol brightness "OTHR"
B. Symbol brightness "PR LN"
C. Symbol brightness "ARO"
D. Symbol brightness "TRKS"

18. Which task selection switch allows entry of console filters?

A. Track Data
B. ADL Data
C. Status Board Data
D. PPI Data Entry

19. When altitude filter is selected, all tracks outside the set limit will be filtered out except ----------?

A. Hostile and Hooked Tracks.
B. Hooked, Hostile, and Priority Tracks.
C. All Hostile Tracks.
D. Hooked, Special, and Priority Tracks.

20. Which task selection switches are valid in the monitor mode?

A. Track Data, ADL Data
B. Q73-RR, PPI Data Entry
C. Assign, Status Board Data
D. Video Switch, Target Proc Param

21. To erase a clutter map which is the last switch you press?

A. Proc Normal
B. Proc MTI
C. Censor
D. Return to Auto

22. In order to perform the task function of designating an individual EM (Engagement Marker) for display, which task selection switch must be pressed?

    A. Target Proc Param
    B. Video Switch
    C. PPI Data Entry
    D. Track Data

23. While using the video switch task selection, the Map 1 is designated from the console keyboard. What is the range of Map designators allowed for a valid entry?

    A. A-H
    B. K-V
    C. A-Z
    D. A-J

24. What is the effect of completing a Proc MTI Clutter Gate?

    A. Only MTI video is designated to be processed in the gate.
    B. All video except MTI will be processed in the gate.
    C. No video will be processed in the gate.
    D. Only hostile video will be processed in the gate.

25. Clutter Maps may be built in all system modes except?

    A. Track
    B. Tac
    C. Monitor
    D. Test

26. Which console mode are the display consoles in as a result of system initialization?

    A. Monitor
    B. Test
    C. Tracking
    D. Tactical

27. If no selection is made under ARO Data Selections what will be displayed?

    A. Nothing
    B. Filter Data
    C. First 8 FU's
    D. Jam Strobes

28. How many Maps may be displayed at one time on the PPI?

    A. 2
    B. 3
    C. 4
    D. 10

29. Each angle mark is separated by ----- degrees.

A. 20
B. 15
C. 25
D. 18

30. Sim-Test Tracks Switch is used to display which of the following?

A. Local Manual Sim-Test Tracks.
B. Local Auto Sim-Test Tracks.
C. Raid Generated Tracks.
D. All of the above.

31. To "Erase" a manual clutter gate, the ---------- switch is used.

A. Censor
B. Gate Complete
C. Return to Auto
D. Clear

32. When entering interrogate modes from the console, what must be done if "RIE Mode" appears in Row 7 Columns 57-64?

A. Enter CC1104 3 MLU 1
B. Enter CC 100 50
C. Enter CC05
D. Enter CC06

33. When displaying background data showing 20 KM range marks every ----- ring is intensified?

A. Fifth
B. Fourth
C. Third
D. Second

34. If no console filters are entered which tracks would be filtered out?

A. All tracks
B. No tracks
C. Low threats
D. High threats

35. After designating links 4 & 5 under Q73-RR Task Selections which group of switches would be used to display those remote tracks?

A. Track Data Display ATMS/TOS
B. Task Selection Track Data
C. Track Data Display Q73-RR
D. Track Data Display Other Services

1. In order to drop an engaged jam strobe which of the following is true?

   A. You cannot drop a jam strobe.
   B. You cannot engage a jam strobe.
   C. Drop must be pressed twice.
   D. None of the above is true.

2. The maximum number of jam strobes that may be displayed at one time is?

   A. 10
   B. 32
   C. 8
   D. No limit

3. When sequence hooking alerts, the hook symbol appears around the track, FU, or jam strobe and information about the alert condition appears in Row ----- of the hooked item data field of the ARO.

   A. 1
   B. 7
   C. 8
   D. 9

4. A local manual track symbol is flashing. What is a valid reason for this alert?

   A. The track has to be updated.
   B. The track is a hostile.
   C. The track is a friend.
   D. The track has to be dropped.

5. Which of the following is not a valid Mode 2 response?

   A. 3457
   B. 2222
   C. 7856
   D. 6765

6. When manually updating track, the update position must be within ----- data miles of the previous location.

   A. 8
   B. 12
   C. 64
   D. 100

7. The last digit of a track alphanumeric block indicates?

   A. Tracking mode or track quality
   B. Raid size
   C. Track Height
   D. Threat priority

8. To remove an individual time to go vector you would?

   A. Dehook
   B. Repeat procedure
   C. Drop the track
   D. Send compliance code

9. Manual velocity and heading entries are not valid for tracks in the auto-tracking mode.

   A. True
   B. False

10. When assigning site a non-transmittable address and name.

   A. The Site Address must be numeric only (0000-9999).
   B. The Site Name must be alpha characters only (AAAA-ZZZZ).
   C. The Site Name and Address can be alphanumeric (0000-9999, AAAA-ZZZZ).
   D. None of the above.

11. In order to give a track a "TBM" modifier, which of the following is true?

   A. Track must be hostile.
   B. Track must have a high threat priority.
   C. Track must have a speed above 800 Data MPH.
   D. Track must have a raid size of many.

12. When a console filter is activated the only tracks that are not filtered are?

   A. Hooked
   B. Special
   C. Priority
   D. All of the above

13. A Mode 2 response would be found in?

   A. Row 7 Columns 39-42 of the ARO.
   B. Row 7 Columns 34-37 of the ARO.
   C. Row 2 Columns 33-39 of the ARO.
   D. Not found in the ARO.

14. Mode C is used to determine?

   A. Track Raid Size
   B. Tracking Status
   C. Aircraft Altitude
   D. Threat Priority

15. With the range scale switch set to the 1/8 position, from the center of the PPI to the outer edge represents how far?

   A. 256 Data Miles
   B. 128 Data miles
   C. 64 Data Miles
   D. 512 Data Miles

16. When entering the fixed point site symbology for a command post, the symbol code that would be entered on the AN Keyboard would be?

A. T
B. A
C. O
D. C

17. The system automatically processes tracks to an unknown altitude of 20,000 feet, with an "ARO" readout of 020, U what would an estimated altitude of 20,000 feet look like in the "ARO"?

A. 020, E
B. 020, R
C. 020, U
D. 020, A

18. When using the TPX-46, how many modes may be designated for interrogation at any one time? (System Modes)

A. 1
B. 2
C. 3
D. 4

19. When manually interrogating a track the first step taken is?

A. Hook track to be interrogated.
B. Press task selections ident IFF
C. Center IFF Mode
D. Press task functiona interrograte

20. When manually initiating a track using a pre-selected ATDL-1 track number?

A. The pre-assigned track numbers may be the same as a current number in the track file.
B. The pre-assigned track numbers may not be the same as a current number in the track file.
C. Can't be done this way.
D. Doesn't matter.

21. In order to perform a Mode 4 Intergration which of the following is true?

A. Track must be hostile.
B. RIE I must be in TPX-28.
C. Must have raid size of single.
D. RIE I must be in TPX-46.

22. To drop a fire unit from the PPI,

A. Your console must be in the monitor mode.
B. You must hook the fire unit and press drop twice.
C. Two drop actions in succession are not required.
D. You cannot drop a fire unit.

23. Where in the hooked track data field do you look for ID information?

A. Row 7, Col 31 and 32
B. Row 7, Col 34 and 37
C. Row 7, Col 39 thru 42
D. Row 2, Col 36 and 39

24. When entering height data on the AN/Keyboard, the source ----- separated from the value by a space.

A. Is
B. Is not

25. Manually updating an auto-track will cause?

A. An illegal action alert.
B. The track symbol to move to a designed location.
C. The auto track to change to RAMIT.
D. Both B and C are correct.

26. When entering the amplifying "ID" the third digit is the?

A. Primary ID Code
B. Secondary ID Code
C. AMP Code
D. Used to send change data order

27. While in the tracking mode, which of the following task selections can be selected?

A. Assign
B. Status Board Data
C. ADL Data
D. Engage Ripple

28. Console filters entered into one console are automatically entered into all other consoles.

A. True
B. False

29. When an auto track is changed to a sim-test track.

A. Automatically initiated tracks cannot be changed to Sim-Test.
B. The IFF information contained in Row 7 of the hooked track data in the ARO is cleared.
C. The last character of the second line of the track alphanumeric block becomes T.
D. None of the above.

30. When entering a fixed point site by using the "GEOREF" method, you must first position the tab marker on the desired location on the PPI.

A. True
B. False

1. Row No's are used to identify which line of the DDG is going to present fire unit data. Row 23 is located where?

   A. Near top of left side of DDG.
   B. Near top of right side of DDG.
   C. Near bottom of left side of DDG.
   D. Near bottom of right side of DDG.

2. In order to decrease the cold missile count by one, you would press the missile expended switch.

   A. True
   B. False

3. The ------- configuration is required to operate a raid tape.

   A. CC20 or 24
   B. CC21 or 25
   C. CC25 or 26
   D. CC25 or 27

4. Which of the following is first required to move fire unit A12 from one row of the DDG to another row?

   A. The first unit must be hooked.
   B. "A12 Clear" must be entered on the keyboard.
   C. "A12 00" must be entered on the keyboard.
   D. "A12 01 00" must be entered on the keyboard.

5. Which of the following "CC Commands" are not site adaptable?

   A. CC04, CC05
   B. CC03, CC01
   C. CC17, CC30
   D. CC121, CC123

6. What must the operator do if less than eight fire units are entered while calling up a raid?

   A. Eight fire units must be entered.
   B. Enter 06 on the thumbwheels.
   C. Enter CC 130
   D. Press req send on the KPU twice in succession.

7. What does the "INTRG AUTO/MANUAL" switch control?

   A. Enables automatic IFF interrogation.
   B. Inhibits automatic IFF interrogation.
   C. Both of the above.

8. Which command is used to stop an engagement on a friendly track?

   A. Hold Fire
   B. Cease Fire
   C. Cease Engage
   D. Salvo

9. The maximum cold missile count is?

   A. 127
   B. 31
   C. 20
   D. 999

10. What procedure is used to manually assign a hostile track to a specific fire unit?

   A. Hook Fire Unit, Hook Track, and Press Engage.
   B. Hook Track, Hook Fire Unit, and Press Engage.
   C. Press Assign, Hook Track, Hook Fire Unit.
   D. Hook Track, Press Engage.

11. A Jam Strobe can be entered from?

   A. Own site only.
   B. Own site and fixed point sites only.
   C. Fixed point sites only.
   D. Anything that's hookable plus your own site.

12. After clearing the effective on a track, a new assignment cannot be made.

   A. True
   B. False

13. Pressing the task selection status board data will activate the?

   A. Task selection switches
   B. Task function switches
   C. ADL Data Switches
   D. None of the above switches

14. The track/tac switch is located:

   A. The Tactical Panel
   B. The RIE I Panel
   C. The System Mode Panel
   D. The Fire Unit Data Display

15. When a hold fire is sent on a track, which of the following is true?

   A. Track becomes special.
   B. Track becomes priority and HF appears in the tracks AN's.
   C. Track becomes priority and H appears in Row 2 Column 2 of the tracks AN's.
   D. Nothing happens to the track.

16. In order to have the computer assist you in target to fire unit assignments, you would use what mode of operation?

    A. Automatic
    B. Semi Automatic
    C. Manual
    D. No Such Mode Exists

17. To terminate a raid, the following command is entered.

    A. CC17
    B. CC30
    C. CC104
    D. CC14

18. If the fourth letter in the second row of the track alphanumerics is A"M", what does this signify?

    A. A raid size of many.
    B. A manual initiated track.
    C. A marginal priority track.
    D. A manual IFF response.

19. Are low threat priority tracks given a recommended assignment?

    A. Yes
    B. No

20. B!01!RL!R!AB077!E!AB141!R!027!09! Using the above information, answer the following question. (What is the secondary assignment for the fire unit?)

    A. AB077
    B. Engage
    C. Engage Ripple
    D. AB141

21. If the range of the PPI is 512 data miles in the 1 scale, what is the range of the PPI Display in the 1/8 range scale?

    A. 64 data miles
    B. 4096 data miles
    C. 128 data miles
    D. 265 data miles

22. What will happen if an "S" is entered on the AN/Keyboard before manually initiating a track?

    A. Illegal action "Keyboard error"
    B. Special track is initiated.
    C. Simulated track is initiated.
    D. TBM is initiated.

23. To cause the center of the radar sweep to be at the lower edge of the display screen . . .

    A. the ball tab is moved to the lower edge and designate offset is pressed.
    B. the radar needs to be aligned.
    C. the RIE in the AN/TSQ-73 needs to be adjusted.
    D. the ball tab is moved to the top edge and designate offset is pressed.

24. Following cancellation of a secondary assignment, the following visual indication can be seen.

    A. The Alert Lamp illuminates.
    B. The Cancel Lamp illuminates.
    C. The ARO Secondary Assigment starts flashing.
    D. The Dashed Pairing Line disappears.

25. While operating against a raid, the following actions can be performed.

    A. Manual Track Initiation
    B. Ramit Track Up-Date
    C. Manual Weapons Assigment
    D. All of the above are correct.

26. In order to enter status board data, you must be in the tracking mode of operation?

    A. True
    B. False

27. Which CC Command would be used to change to system state of alert from white to red?

    A. CC 117
    B. CC 114
    C. CC 120
    D. CC 115

28. Which light will come on if the track/tac switch is pressed twice in a row?

    A. Tac only
    B. Track Only
    C. Track/Tac
    D. Neither light comes on.

29. After offsetting the scope, can you return to normal center by pressing the center/offset switch?

    A. Yes
    B. No

HPU. -

30. The following information is displayed across one row of the DDG (Note * represents a blank display) ---- C061HO**********00907 which of the following is a true statement?

A. FU C06 is at a one hour alert status.
B. FU C06 has 9 hot missiles, and 0 cold missiles.
C. FU C061 is out of action.
D. FU C06 is at operating status.

31. What is the number of categories that can be entered for sequence hooking?

A. 4
B. 5
C. 6
D. 7

32. Raid tape operations as shown in TM 9-1430-652-10-3 on Figure 7-2. indicates that raids begin at:

A. 00-01-00 hours
B. 00-00-00 hours
C. 00-00-01 hours

33. Select the switch which is used when a change in the missile count is to be made.

A. F.U. Alert Status
B. Status Board Data
C. F.U. Status
D. Assign Row Number

34. Which of the following lists contains all the correct sequence hook criteria keyboard entries?

A. H,E,L,P,M,Y,C,A,R
B. H,E,L,P,R,I,N,G
C. H,E,L,P,F,A,T
D. H,E,L,P,D,O

35. B!23!1H!O! ! ! AB127!E!031!13! Using the information at the left answer the following question. Why is the information shown in the DDG incorrect?

A. Fire unit cannot engage tracks while out of action.
B. Fire unit has to have a primary assignment first.
C. You cannot have a fire unit 23.
D. Both A and B are correct.

36. The KPU has printed the following error message (77 00 33 Device Timeout) this indicates what to the operator?

A. Improper entry from the KPU.
B. Device does not respond to activate command.
C. Device was not checked by the computer.
D. Attempt to perform "BN" only operation at group.

37. The fire unit alert status can be entered into the system by?

A. Manual Operations
B. Voice Communications
C. ADL Operations
D. Both A and C

38. Cease Engage Commands are transmitted to and displayed at, MBDL Fire Units as?

A. Cease Fire Commands
B. Hold Fire Commands
C. Salvo Commands
D. None of the above.

39. Data Link messages for secondary assignmenst are sent to the fire unit?

A. True
B. False

40. How many simulated fire units can be entered to operate against a raid?

A. Maximum of twelve.
B. Maximum of eight.
C. Maximum of ten.
D. Maximum of six.

1. What compliance codes are used when responding to a change data message?

   A. WC, CC, HC
   B. HF, CF, CE
   C. Both A and B
   D. None of the above.

2. Info. difference messages are complied with in the same manner as change data messages with one exception:

   A. Fire unit status must be changed prior to pressing clear alert.
   B. Track ID must be changed prior to pressing clear alert.
   C. Both track and fire unit status must be changed prior to pressing clear alert.
   D. None of the above.

3. What actions are required to comply with a message in Row 8 of the ARO that reads: "Alert:ER:RESPREQD,GD?"

   A. Press task functions clear alert, and take appropriate action IAW unit SOP.
   B. Press task selections ADL Data, enter compliance code on AN/Keyboard press task functions compliance code, press task functions clear alert, and take appropriate action IAW unit SOP.

4. Which Data Link is used to communicate with other services?

   A. MBDL
   B. NATO
   C. SP
   D. IA/TB

5. When sending an operational status command message, which of the following is not a legal address?

   A. 7765
   B. 666
   C. AB065
   D. AB087

6. What does the letters IA/TB indicate?

   A. Intra-Action/TADIL-B
   B. Intra-Army/TADIL-A
   C. Intra-Army/TADIL-B
   D. None of the above.

7. Which of the following is a command message?

   A. Cease Fire.
   B. Cover
   C. Neither A Nor B
   D. Both A and B

8. The AN/Keyboard entry of (D) when sending an action management message means:

   A. Information Difference Report
   B. Data Update Request
   C. Cease Reporting
   D. Change Data Order

9. As an AN/TSQ-73 operator, what type of information do you receive from a fire unit?

   A. Command Information
   B. Status Data
   C. Reference Data
   D. Nothing

10. You are sending a terminate command "Hold Fire" by entering the command code "HF" on the AN/Keyboard. You must press the:

   A. Task Function - ADL ADRS Switch
   B. Task Function - CMD CODE Switch
   C. System Mode - Hold Fire Switch

11. Command messages may be sent to which types of fire units?

   A. TADIL-A tied only
   B. Reporting ATDL-1 and MBDL tied
   C. TADIL-B non-tied only
   D. Reporting ATDL-1 and MBDL non-tied

12. A salvo command can be received by an MBDL fire unit.

   A. True
   B. False

13. What are 3 methods of REF/DEREF tracks?

   A. TAC/SOP, source, CMD-Code
   B. COMP-Code, CMD-Code, TAC/SOP
   C. Catagory, Source, Type
   D. Catagory, Source, Individually

14. To exchange data with another agency you send an

   A. Action Management Message
   B. Command Message
   C. Alert Message
   D. Command Management Message

15. Sending an Action/Management Message Code (T) will cause:

   A. The track symbol to revert to track ID.
   B. Special track symbol to flash.
   C. Data Banks to be Purged.

16. Which of the following is/are Action Management Messages?

A. Force Tell
B. Emergency Tell
C. Info Diff Report
D. All of the above.

17. For a complete definition of system alerts you would use which TM.?

A. 10-2
B. 10-3
C. 10-1
D. 10-5

18. What happens when any of the task functions reference-dereference switches are activated for the second time?

A. Tracks become referenced.
B. Tracks become dereferenced.
C. Track will become a special.
D. Nothing happens.

19. The Group System has the only link to other services?

A. True
B. False

20. What information is contained in an operational status message?

A. Weapons status, state of alert, senders address
B. Weapons status only
C. State of alert only
D. Weapons status and senders address

21. After the fire unit sends you an effective or ineffective on a track, the fire unit should return to what status?

A. Tracking
B. Firing
C. Ready
D. Both A and C

22. The Action/Management Message "Force Tell Request" is entered on the AN/ Keyboard as coed:

A. P
B. R
C. F
D. T

23. To send the Action/Management message "Emergency Tell" you must first:

A. Enter L on the AN/Keyboard
B. Hook the track.
C. Hook the site.
D. Press task selections - ADL Data.

24. Reference/Dereference functions are used by?

A. Group only
B. Air Force
C. MBDL Fire Units
D. ATDL-1 Fire Units

25. As AN TSQ-73 Console Operator, what two types of information do you send to a fire unit in either MBDL or ATDL-1 formats?

A. Command and Status
B. Nothing
C. Status Data Only
D. Command and Reference Data

26. When sending a command message needing a weapon type, entry of A 3 would specify which weapon type?

A. Nuclear
B. Missile
C. Not Specified
D. Conventional

27. What are the two types of communications used in the AN/TSQ-73?

A. OPNL Net and CMD AD Communications.
B. MAINT and Local Comm Communications.
C. Data and Voice Communications.
D. Voice and OPNL NET Communications.

28. Two types of operational status command messages are?

A. HF, CF
B. CE, CX
C. CX, IN
D. WT, WF

29. What is the first step required to send the operational status command message-weapons tight?

A. Enter WT on AN.
B. Press task selections - ADL Data
C. Press Task Functions - CMD Code
D. Hook the site.

30. The task function - engage ripple switch is pressed during an assign weapons command message for:

A. Ripple Fire
B. Cover
C. Assign/Investigage
D. Hold Fire

31. Which data link format is used to communicate with fire units, ATMS, TOS, and other AN/TSQ-73 Systems?

A. SP
B. IA/TB
C. NATO
D. MBDL

32. What is the first action required to react to the following condition? _____"Special track begins flashing on PPI and the console alert action reqd illuninates.

A. Press task functions - ADL Data
B. Press task functions - CMD Code
C. Hook the track
D. Panic

33. A priority track with the alphanumeric readout of "AB065" in the first row and "FA057" in the second row indicates what type of priority?

A. Force Tell
B. Hold Fire
C. Friend Special Mission
D. TBM

34. Tracks are referenced so that the ----- can identify the track to be engaged?

A. Q-73 Operator
B. R.I.E.
C. Fire Unit
D. A.D.P.E.

35. What type of symbol will referenced tracks have?

A. Flashing
B. Solid
C. Dashed
D. Unknown

1. On the RIE 1 Panel under video distribution, how many types of video can be displayed with the special video select switch?

   A. 6
   B. 5
   C. 8
   D. 7

2. What 4 types of system status messages does the KPU print out?

   A. TMON Fault, CPU Error, CPU Overload, and Device Status
   B. CPU Error, Hot Loop Test, TMON Fault, Carousel Rotation
   C. TMON Fault, CPU Error, CPU Overload, and Data Systems Delete
   D. Data Systems Delete, CPU Overload, Carousel Rotation, and TMON Fault

3. A TMON Message indicates what type of fault?

   A. Too much data
   B. Software problems
   C. Device failure
   D. Current time of day

4. Which subunit provides the range and azimuth information?

   A. (RIU)
   B. (IIU)
   C. (VPU)
   D. (DIU)

5. The term "L.E.D." means?

   A. Light Energized Diode
   B. Lease Equitable Denominator
   C. Liquid Emitting Diode
   D. Light Emitting Diode

6. PPI landmarks or clutter are compared to:

   A. Other AN/TSQ-73 systems display.
   B. Local radar PPI display.
   C. Military maps of the same area.
   D. Change data order.

7. Where do radar signals coming from the radar junction box (RJB) enter the AN/TSQ-73 shelter?

   A. Radar Demarkation Panel
   B. Communication Panel
   C. Environmental Demarkation Panel
   D. Power Panel

8. A CPU-2 Overload message indicates that you have?

A. A software problem
B. Too much data to process
C. Overheating
D. A hardware problem

9. Which subunit of the (RIE) provides simulated targets for raid exercises?

A. (VSU)
B. (IIU)
C. (VDU)
D. (VPU)

10. When checking comp video (Compressed Video), what difference is acceptable?

A. Slight shift of target position is OK.
B. Slight difference in intensity is OK.
C. Slight change of number of target is OK.
D. Absolutely no differences are allowed.

11. The video selection to check processed video is made from?

A. The Consoles
B. The RIE 1 Panel
C. The KPU
D. Hold Fire

12. Which TM is used in order to perform an emergency reconfiguration?

A. TM 9-1430-655-10-5
B. TM 9-1430-655-10-3
C. TM 9-1430-652-10-1
D. TM 9-1430-652-10-3

13. The PPI displays permanent features like mountains, etc. as?

A. IFF
B. Clutter
C. RIE
D. MTI

14. What does "MTI" stand for?

A. Moving Target Indicator
B. Missing Target Indicator
C. Multiple Target Indicator
D. Multiple Threat Indicator

15. How many memory units are there in the RIE?

A. None
B. 1
C. 2
D. 3

16. Which switch controls power to the RIE 1 and RIE 2 Panels?

A. RDR/CPU on Line/Off Line Switch
B. Power On/Off Switch.
C. Integrated On/Off Switch
D. Bite Switch

17. The Bite Switch on the RIE Panel 2 is the ----- Switch.

A. Built in Target Enquiry
B. Basic Integration Target Evaluation
C. Balance Inserted Target Exit
D. Built In Test Equipment

18. The SIF Alinement switch located on the RIE 1 Panel is called a?

A. Window switch
B. Value switch
C. Thumbwheel switch
D. Rotary switch

19. Diagnose status indicators are located on the?

A. ADP Panel
B. FPU
C. DDG Panel
D. Consoles

20. On the RIE 1 Panel under "IFF Parameter," what type of switch is the M4 Alignment (0.1 US) switch?

A. Three position rotary switch
B. Momentary action, pushbutton
C. Four, ten position thumbwheel switch
D. Eight position rotary switch

21. When processed video is displayed on the PPI it will appear as?

A. A fuzzy line
B. A check mark
C. A small box
D. A star

22. Which of the following is a system status message?

A. Tmon fault
B. Info difference message
C. Action/management message
D. Site adaption report

23. The guide used by you to set the RIE switches is the?

A. TM 9-1430-652-10-3
B. TM 38-750
C. Data sheet
D. Press task selections - ADL Data

24. When verifying identification - friend or foe operations, what type of video is selected at the console?

A. Test
B. Special
C. Normal
D. IFF/SIF

25. Prior to RIE power on, what is the preliminary control setting for the (HIPAR) alinement for the mode interlace switch?

A. Off
B. 1
C. 2.3
D. 3

26. Using the flowchart on Figure 4-55 sheet 1, you have a TMON fault link failure your next step would be?

A. Reboot the system
B. Check environmental controls
C. Reconfigure system
D. Identify modem number

27. Which subunit of the Radar Interface Equipment (RIE) converts raw radar video into processed video?

A. (IIU)
B. (VSU)
C. (DIU)
D. (VPU)

28. What AN/TSQ-73 equipment enables the system to interface with a wide variety of radar?

A. Radar Interface Equipment (RIE)
B. ADPE
C. Consoles
D. VCC

29. If you receive a TMON fault with a code of 700370 what 2 things would be done first following your emergency reconfiguration flowchart?

A. Shut off system and rebootload.
B. Shut off RIE and put RIE off-line.
C. Set program test select thumbwheels to 00 and press restart.
D. None of the above, notify organizational maintenance.

30. Which two TM's are used for reference to initialize and aline the RIE?

A. TM 9-1430-652-10-3 and 10-5
B. TM 9-1430-652-10-2 and 10-6
C. TM 9-1430-652-10-4 and 10-5
D. TM 9-1430-652-10-3 and 10-7

31. Which subunit directs video traffic within the RIE?

A. Radar Interface Unit (RIU)
B. IFF Interface Unit (IIU)
C. Video Simulator Unit (VSU)
D. Video Distribution Unit (VDU)

32. On the radar junction box which switch compensates for lead resistance due to radar cable length?

A. Radar select
B. ACP/ANP
C. Cable comp
D. CW/CCW

33. Following initialization of the system, what is the position of the Memory 1 switch on the RIE 2 panel?

A. Off
B. Off-Line
C. On-Line
D. On

34. Which device links the AN/TSQ-73 shelter with its associated radar and IFF equipment.

A. .). Radar Interface Equipment (RIE)
B. Automatic Data Processing Equipment (ADPE)
C. Radar Junction Box (RJB)
D. Consoles

35. What 3 places do you check first for a fault indication?

A. The MTU's, consoles, and ADP
B. The KPU, VCC, and Remote Radar
C. The DDG, KPU, ADP Panel
D. The DDG, MCPE, and RIE 1 Panel

HPO. 21011

1. The Local communications directory has space for five entries, subscribers listed on the "LCD" may be?

   A. Group, BN A, BN B, R. R. 1, R.R.2.
   B. Orderly room, USAF, Battery 021.
   C. Supply room, HQDA, USAF.
   D. Battery A, Battery B, etc.

2. When entering a command code (CC), the limits for the numerics must be within?

   A. 00 thru 100 Decimal
   B. 01 thru 150 Octal
   C. 00 thru 150 Octal
   D. 00 thru 150 Decimal

3. The time of day can be entered through which of the following?

   A. Display console AN/Keyboard
   B. KPU
   C. ADP Panel
   D. Both A and B

4. Which console mode are the display consoles in as a result of system initialization?

   A. Trac/Tac
   B. Test
   C. Track
   D. Monitor

5. If you entered CC101-53 into the system which device would be effected and how?

   A. DDG#1 would be turned off.
   B. KPU would be turned off.
   C. Nothing would happen.
   D. MTU 1 would be turned off.

6. Which TM should be used as a reference for command code format and contents?

   A. TM 10-1
   B. TM 10-2
   C. TM 10-4
   D. TM 10-6

7. What difference is acceptable when comparing "Comp Video" on the display console to video that has not been compressed?

   A. Slight shift of target position is acceptable.
   B. Slight difference in target brightness is acceptable.
   C. Slight change in number of targets visible is acceptable.
   D. Absolutely no difference is accepted.

8. Which Q-73 RR links can be selected or inhibited from display at the BN. TSQ-73 System?

   A. 1,2,3,4,5,6, and 7.
   B. 3,4,5,6,7,10,11,12, and 13.
   C. 3,4,5,6, and 7.
   D. 1,2,3,4, and 5.

9. Which of the following performs a check on both CPU's?

   A. Bootstrap Load
   B. ADP Operational Checkout
   C. KPU Test
   D. Both A and B

10. How may a track number be changed once it has been initiated by the computer?

   A. Fire Unit Order
   B. Group Order
   C. Manual Intervention
   D. Computer Change

11. Which "CC" command is site adaptable?

   A. CC 23
   B. CC 05
   C. CC 120
   D. CC 122

12. While bootloading the system, the KPU prints (77 00 03 System Tape Format Error) this would indicate to the operator?

   A. System tape is bad.
   B. System tape not installed correctly.
   C. System has been purged.
   D. System needs a restart command.

13. Audio and data leave the shelter via the commo demarkation panel, these are labeled connector J1 through J32 and each line contains ---- voice and ---- data lines?

   A. 3 voice and 3 data comm lines.
   B. 1 data and 4 voice comm lines.
   C. 1 voice and 3 data comm lines.
   D. 3 voice and 1 data comm lines.

14. What must you hook in order to see the "CANTCO" on the jam strobe engagement?

   A. Fire Unit
   B. Jam Strobe
   C. Hostile Track
   D. Friendly Track

15. Using TM 9-1430-652-10-3 , what MTU address is the raid tape installed?

A. 0
B. 1
C. 10
D. 11

16. There are 3 data fields in the ARO which are?

A. Status, Summary and Hooked Item.
B. Status, Hooked Item, and PPI
C. Summary, Status
D. Hooked Item only

17. ARO message alert row 7 columns 57 thru 64 display "CSL MODE" this would be which alert condition number?

A. 46
B. 47
C. 45
D. 44

18. Modem frequency for "ATDL-1" are which of the following?

A. 1200 BPS - 1300/2100 HZ with a center frequency of 1700 HZ.
B. 1500 BPS - 1125/2625 HZ with a center frequency of 1875 HZ.
C. 600 BPS - 1300/1700 HZ with a center frequency of 1500 HZ.
D. 750 BPS - 1125/1875 HZ with a center frequency of 1500 HZ.

19. What does "RIE" mean?

A. Radar Intergrations Equipment.
B. Raid Interlocking Equipment.
C. Radar Interface Equipment.
D. None of the above.

20. While in the tracking mode, which of the following task selections are valid?

A. Assign
B. Status Board Data
C. ADL Data
D. Engage Ripple

21. How many digits are entered on the "VCS" keyboard when connecting a subscriber?

A. 5
B. 4
C. 3
D. 2

22. The "Shelter" switch on the main power panel is a circuit breaker that is rated at ------- and controls -----?

A. 50 amps 120 HZ.
B. 30 amps 400 HZ.
C. 50 amps 400 HZ.
D. 30 amps 120 HZ.

23. When entering a speed limit filter on your console the upper speed limit is?

A. 000-512 D.M.
B. 000-265 D.M.
C. 000-719 D.M.
D. 000-128 D.M.

24. When making assignments of links to modems, what is the first thing you must do?

A. Locate and turn on the correct modem.
B. Activate the correct link.
C. Type in the correct CC command.
D. Determine the link to be used.

25. Operational status weapons "tight" allows the console operator to assign?

A. Unknown and hostile tracks.
B. Friendly tracks.
C. Only unknown tracks.
D. Hostile tracks.

26. What TM deals with the removal and replacement of the ADPE subassemblies?

A. TM 20-4
B. TM 20-5
C. TM 20-6
D. All of the above

27. What part of the following publication code refers to the type of publication? - TM 9-1430-652-10-3 -

A. TM
B. 8
C. 1430
D. 652

28. What is the maximum number of fire units that can be controlled by a battalion?

A. 24
B. 12
C. 8
D. 10

29. How many sections are there to the voice communication directory?

A. 5
B. 4
C. 6
D. 3

30. If the KPU is not being used the motor will automatically turn off after what period of time?

A. 60 seconds
B. 90 seconds
C. 70 seconds
D. 80 seconds

31. Which AN/TSQ-73 System equipment enables the system to interface with a wide variety of radars?

A. ADPE
B. VCC
C. RIE
D. Consoles

32. A diagram consisting of symbols and connecting lines that show a step-by-step progression through a usually complicated procedure is called?

A. A flow chart
B. A grid chart
C. A loop test
D. A puzzle

33. What responses can be expected for Mode 4 challenges?

A. A 4 digit code
B. A 3 digit code
C. TF, NI, NR, NF, etc.
D. None of the above

34. Emergency shut down is accomplished through the?

A. CPU
B. RIE
C. Power Panel
D. TAC Generator

35. Which of the following is a transmittable site without using "CC115"?

A. Ordinance Storage
B. ECM Fixes
C. Command Posts
D. Track Parks

36. What is the abbreviation for tracks that are entered manually into the system?

A. RMIT
B. RAMIT
C. RIMAT
D. RAMMT

37. As an AN/TSQ-73 operator, what two types of information do you send to a fire unit in ATDL-1 Format?

A. Command and Reference Data.
B. Command and Status Data.
C. Status Data only.
D. Commands only.

38. In the monitor mode of operation which situation(s) is/are true?

A. Fire Units can engage tracks.
B. Track identity can be changed.
C. All of the above.
D. None of the above.

39. While in which status may a Fire Unit engage a track?

A. O
B. T
C. R
D. L

40. How is track height above 99K feet displayed?

A. AB
B. DC
C. XX
D. 11

41. If you entered CC100-72 into the system you would be taking what action?

A. Activating DDG#2
B. Activating DDG#1
C. Deactivating DDG#1
D. Deactivating DDG#2

42. Which TM should be used as a reference when performing initialization and operating procedures?

A. TM 10-1
B. TM 10-2
C. TM 10-3
D. TM 10-6

43. What is the center frequency of the ATDL-1 message?

A. 1500 HZ
B. 1700 HZ
C. 1200 HZ
D. 1300 HZ

44. The "VCS" can access up to 60 subscribers, this can be expanded to access up to ----- subscribers?

A. 78
B. 96
C. 90
D. 87

45. What is the maximum number that can be entered for Mode 1 IFF?

A. 65
B. 85
C. 93
D. 73

46. If the flow chart designer wishes you to go the opposite direction to the normal flow he would?

A. Use arrows to indicate direction.
B. Use note to indicate direction.
C. Never changes directions.
D. None of the above.

47. The following criteria have been entered on the AN/Keyboard L,A,E,F,H. What will happen when the sequence hook switch is pressed?

A. All local tracks will be hooked.
B. The ADP will prioritize the criteria in the following order: A,E,F,H,L.
C. All alerts will be hooked.
D. An illegal action: "KBD ERR" will occur.

48. Using CC01 (POS) (ALT) (T) the letters (POS) indicate what?

A. Positive action by operator taken.
B. Location of own site.
C. Position of aircraft from own site.
D. Position of group system.

49. During raid tape operation and on line simulation when would you use table 7-2?

A. When you have a local radar.
B. During hardware initialization.
C. When no local radar is used.
D. When recording a raid.

50. Which subunit of the RIE provides simulated targets for raid exercises?

A. VPU
B. VSU
C. IIU
D. VDU

51. To perform the task function of designating a individual "EM" for display, which task selection must first be pressed?

A. Target Proc Param
B. Video Switch
C. PPI Data Entry
D. Track Data

52. Which of the following software functions makes air defense tactical decisions?

A. M&D
B. BOCP
C. SIM
D. SSP

53. What is the size of a remote source track symbol?

A. 1 inch
B. 1/2 inch
C. 1/8 inch
D. 1/4 inch

54. What is the system "G" sensitivity default value?

A. 3
B. 2
C. 4
D. 5

55. Refering to Figure 4-29 of TM 10-3 which TM would be used as a reference to "ID Amplification Code Entries"?

A. TM 10-1
B. TM 10-2
C. TM 10-7
D. TM 10-6

56. When in the tracking mode, which of the following is not a valid task function?

A. Change track ID
B. Change track height
C. Change raid size
D. Engage tracks

57. A numbering system which has a base of sixteen symbols and letters is called the?

A. Binary System
B. Byte System
C. Hexadecimal System
D. Octal System

58. During "IHAWK ATDL-1" intergration, after you have sent a hold fire, what are the correct indications from the battery?

A. Ready, then broken engagement.
B. Ineffective, then ready.
C. Effective, then ready.
D. Broken engagement, then ready.

59. What indications should you receive when the fire unit presses fire section test and has achieved delay lock?

A. IHAWK target at approximately 30KM range.
B. ARO indicates "FU Self Initiated Engagement".
C. Flashing Pairing line.
D. A and B are correct.

60. When entering ATL. filters which do you enter on the AN/Keyboard first?

A. Upper limits
B. Lower limits
C. Either one first
D. Speed first

61. A Mode 4 challenge may only be performed with the IFF parameters switch in the ----- position?

A. TPX 28
B. Interrogate
C. Correlation to .27
D. TPX 46

62. What is the purpose of the console filters on the TSQ-73 Consoles?

A. To filter unwanted display for that console.
B. To keep dirt out of the system.
C. To keep the system from overheating.
D. To recycle video for display at a later time.

63. The ADP interfaces with all of the following subsystems except?

A. Display
B. RIE
C. VCC
D. MTU

64. How many digits are entered on the VCS Keyboard when entering a subscriber?

A. 5
B. 4
C. 3
D. 2

65. What visual indication on the PPI tells the "Tactical Mode Operator" that the Fire Unit has acknowledged an engage assignment?

A. Fire Unit site marker blinks.
B. Engagement marker fades out.
C. Pairing line stops blinking.
D. No visual indicates are present.

66. When entering a CC102 command to assign a data link to a modem at BN. level the link number cannot exceed?

A. 25 Octal
B. 35 Octal
C. 32 Octal
D. 37 Octal

67. When manually updating a track, the update position must be within ---- data miles of the previous update?

A. 64
B. 128
C. 32
D. 54

68. What Fire Unit Status entries on the DDG must be made manually by the operator?

A. U,N,B,P
B. U,N,C,A
C. P,B,U,K
D. P,N,B,C

69. On what other occasion (not periodic checks) will an intergration be run with a firing unit (BYRY)?

A. Not done except for periodic checks.
B. After a move.
C. At midnight each day.
D. Only on holidays.

70. Which subunit of the "RIE" converts raw radar video into processed video?

A. VPU
B. DIU
C. VSU
D. IIU

71. Data leaving the AN/TSQ-73 shelter is sent to a transmitting system which is the?

A. AN/TSC-175
B. AN/TSQ-145
C. AN/TRC-145
D. AN/TRC-73

72. What switch must be on in order to see engagement lines on the PPI?

A. Jam Strobes
B. Pairing Lines
C. Angle Marks
D. Engagement Markers

73. What CC command would be used to change the system state of alert?

A. CC25
B. CC05
C. CC115
D. CC117

74. Which CC command is used to change a track number from ATDL-1 to TADIL-B?

A. CC 112
B. CC 122
C. CC 117
D. CC 116

75. The AN/TSQ-73 "Group" system can exchange data with how many other group systems?

A. 1
B. 2
C. 3
D. 4

# APPENDIX B

# PRACTICAL EXAMINATIONS

## INSTRUCTOR'S SCORE SHEET

HPO. 20304 F6.3 Practical Examination

STUDENTS NAME: _____

STUDENT NUMBER: _____

RANK: _____ CLASS #: _____

START TIME: _____ STOP TIME: _____

A. Task #1

System Hardware Initialization

GO / NO GO

Reason for NO/GO*

B. Task #2

Bootload, ADP Checkout and Correctly bring up a Raid

GO / NO GO

Reason for NO/GO*

C. Task #3

Modem Bypass - Proper Monitoring Procedures

GO / NO GO

Reason for NO/GO*

NOTE: Instructor will explain reason for student not achieving a GO for any portion of this examination.

INSTRUCTOR'S NAME _____

HPO. 21109

EOCCT STUDENT INSTRUCTION GUIDE

The student will be required to perform the following tasks in the allotted time of 80 minutes. This is a GO/NO GO test. If on any task you receive a NO GO, you will be required to retake the test before receiving a GO status. If at any time you require instructor assistance, you may ask for it.

Task No. 1

a. Install site-adapted tape.
b. Perform ADP operational checkout.

Task No. 2

a. Configure system to a CC25 from the ADP control panel.

Task No. 3

a. Enter current time of day from the CONSOLE AN/Keyboard.

Task No. 4

Set console display to the following conditions:

a. Local auto tracks (all ID's and alphanumerics).
b. Local manual tracks (all ID's and alphanumerics).
c. Velocity vectors (for all categories).
d. SIM test tracks.
e. Pairing lines.
f. All fire units (and associated data).
g. Track/Tac mode
h. Auto-initiate.

Task No. 5

a. Designate and display Map "A" as Map "1".

Task No. 6

Manually initiate a track 190 Km, from your own site, in the southwest quadrant of the PPI with the following criteria:

a. Altitude of 23,000 feet above MSL indicated by IFF.
b. Speed of 990 data MPH and a heading of 56 degrees.

Task No. 7

a. Set an altitude filter between 12,000 and 29,000 feet and take necessary actions to verify it is operational.

Task No. 8

a. Set up system for auto-interrogation in Modes 1 and 2.
b. Perform a Mode 4 interrogation of an auto track, and note response.

Task No. 9

a. Enter and display a jam strobe from your own site at an azimuth of of 75 degrees.
b. Enter and display a second jam strobe from FU 001 intersecting the first jam strobe.
c. Enter an ECM fix at the point of intersection.

Task No. 10

a. Designate FU 006 as the new center of the PPI display. Return to center position.

Task No. 11

a. Change an auto-track to hostile.
b. Give the hostile track a raid size of few and verify raid size changed to few.

Task No. 12

a. Place system in weapons free mode.
b. Change FU 002 to ready status.
c. Assign the hostile track to FU 002, using an ENGAGE command.
d. Assign any other track to FU 002, using ENGAGE RIPPLE command.

Task No. 13

a. Cancel the secondary assignment.
b. Send a hold fire on the primary assignment.

Task No. 14

Place FU 006 on row 23 of the DDG, giving it the following conditions:

a. One hour alert status.
b. Hot missile count of 9.
c. Cold missile count of 3.

Task No. 15

a. Number hook the highest priority unassigned hostile threat track in the system.
b. Drop the track.

Task No. 16

a. Enter a track park of GEOREF coordinates NKEH5030.
b. Give the truck park a name of UTEP and an address of ARMY.

Task No. 17

a. Sequence hook all fire units.

Task No. 18

a. Change an auto-track to a RAMIT track.

Task No. 19

a. Using the AN/Keyboard, change the system state of alert to "RED."

Task No. 20

a. Correctly purge the system from the ADP panel.

# APPENDIX C

## EXPERIMENTAL STUDENT

## END-OF-COURSE QUESTIONNAIRE

Student
End-Of-Course Questionnaire

Form E

Course: Console Operator Training for MOS 16H10 OSUT Student
Code #_____ Date: _____

DIRECTIONS: This questionnaire is designed to allow you to record your reactions to the course that you have just completed. As a user of the program, you are in the best position to judge the value and the effectiveness of the course. Please complete this questionnaire to the best of your ability by circling one response to every question.

Strongly Disagree 1
Disagree 2
Undecided 3
Agree 4
Strongly Agree 5

1. The AN/TSQ-73 Console Operator Course that I just completed ranks high when compared to other courses that I have previously completed. 1 2 3 4 5

   Comment: _____

2. I am confident that the SITS lessons and the practical exercises, in the course, helped me to develop a high level of ability in performing the AN/TSQ-73 Console Operations. 1 2 3 4 5

   Comment: _____

3. I found it easy to pay attention to the SITS lessons and the practial exercises included in the AN/TSQ-73 Console Operator course. 1 2 3 4 5

   Comment: _____

4. I feel that I was able to complete the practical exercises in a reasonable amount of time. 1 2 3 4 5

   Comment: _____

Strongly Disagree
Disagree
Undecided
Agree
Strongly Agree

| | | | | | | |
|---|---|---|---|---|---|---|
| 5. | The SITS lessons and the practical exercises helped me to perform the tasks required in operating the AN/TSQ-73 Console. | 1 | 2 | 3 | 4 | 5 |
| | Comment: _____ | | | | | |
| 6. | I see no reason why there should be any changes in the practical exercises of the AN/TSQ-73 Console Operator course. | 1 | 2 | 3 | 4 | 5 |
| | Comment: _____ | | | | | |
| 7. | I would like to take other courses that uses the "Student Interactive Training System." | 1 | 2 | 3 | 4 | 5 |
| | Comment: _____ | | | | | |
| 8. | The introduction on how to use the "Student Interactive Training System," was clear and helpful. | 1 | 2 | 3 | 4 | 5 |
| | Comment: _____ | | | | | |
| 9. | The course instructors were very helpful and friendly to me during the time I was using the "Student Interactive Training System." | 1 | 2 | 3 | 4 | 5 |
| | Comment: _____ | | | | | |
| 10. | The environment (room, temperature, noise level, etc.), in which I used the "Student Interactive Training System," contributed to my learning. | 1 | 2 | 3 | 4 | 5 |
| | Comment: _____ | | | | | |
| 11. | I did not have any problems using lessons designed for the "Student Interactive Training System." | 1 | 2 | 3 | 4 | 5 |
| | Comment: _____ | | | | | |
| 12. | The training equipment used in the "Student Interactive Training System," seldom created any problems for me. | 1 | 2 | 3 | 4 | 5 |
| | Comment: _____ | | | | | |

Strongly Disagree _____

Disagree _____

Undecided _____

Agree _____

Strongly Agree _____

13. My learning was seldom interrupted by equipment failure while using the "Student Interactive Training System." 1 2 3 4 5

Comment: _____

14. What did you like about the practical exercises in the AN/TSQ-73 Console Operator Course?

_____

_____

_____

_____

15. What did you dislike about the practical exercises in the AN/TSQ-73 Console Operator course?

_____

_____

_____

_____

# APPENDIX D

## CONTROL STUDENTS

## END-OF-COURSE QUESTIONNAIRE

Student
End-Of-Course Questionnaire

Form C

Course: Console Operator Training for MOS 16H10 OSUT Student
Code #_____ Date _____

DIRECTIONS: This questionnaire is designed to allow you to record your reactions to the course that you have just completed. As a user of the program, you are in the best position to judge the value and the effectiveness of the course. Please complete this questionnaire to the best of your ability by circling one response to every question.

Strongly Disagree 1
Disagree 2
Undecided 3
Agree 4
Strongly Agree 5

1. The AN/TSQ-73 Console Operator Course that I just completed ranks high when compared to other courses that I have previously completed. 1 2 3 4 5

   Comment: _____

2. I am confident that the practical exercises, in the course, helped me to develop a high level of ability in performing the AN/TSQ-73 Console Operations. 1 2 3 4 5

   Comment: _____

3. I found it easy to pay attention to the practical exercise portion of the AN/TSQ-73 Console Operator course. 1 2 3 4 5

   Comment: _____

4. I feel that I was able to complete the practical exercises in a reasonable amount of time. 1 2 3 4 5

   Comment: _____

Strongly Disagree
Disagree
Undecided
Agree
Strongly Agree

| | | | | | | |
|---|---|---|---|---|---|---|
| 5. | The practical exercises helped me to perform the tasks required in operating the AN/TSQ-73 Console. | 1 | 2 | 3 | 4 | 5 |
| | Comment: _____ | | | | | |
| 6. | I see no reason why there should be any changes in the practical exercises of the AN/TSQ-73 Console Operator course. | 1 | 2 | 3 | 4 | 5 |
| | Comment: _____ | | | | | |
| 7. | I would like to take other courses that use practical exercises like the ones in this course. | 1 | 2 | 3 | 4 | 5 |
| | Comment: _____ | | | | | |
| 8. | The introduction that I received to the practical exercise portion of the course was clear and helpful. | 1 | 2 | 3 | 4 | 5 |
| | Comment: _____ | | | | | |
| 9. | The course instructors were very helpful and friendly to me during the time I was in the practical exercises. | 1 | 2 | 3 | 4 | 5 |
| | Comment: _____ | | | | | |
| 10. | The environment (room, temperature, noise level, etc.), in which the practical exercises were held contributed to my learning. | 1 | 2 | 3 | 4 | 5 |
| | Comment: _____ | | | | | |
| 11. | I did not have any problems with the practical exercise lessons. | 1 | 2 | 3 | 4 | 5 |
| | Comment: _____ | | | | | |
| 12. | The training equipment used in the practical exercises seldom created any problem for me. | 1 | 2 | 3 | 4 | 5 |
| | Comment: _____ | | | | | |

Strongly Disagree
Disagree
Undecided
Agree
Strongly Agree

13. My learning was seldom interrupted by equipment failure while I was in the practical exercises. 1 2 3 4 5

Comment: _____

14. What did you like about the practical exercises in the AN/TSQ-73 Console Operator course?

_____

_____

_____

_____

15. What did you dislike about the practical exercises in the AN/TSQ-73 Console Operator course?

_____

_____

_____

_____

# APPENDIX E

## INSTRUCTOR

## END-OF-COURSE QUESTIONNAIRE

## INSTRUCTOR END-OF-COURSE QUESTIONNAIRE

Course: Console Operator Training for MOS 16H10 OSUT Students

Date: _____

DIRECTIONS: This questionnaire is designed to allow instructors and other staff members to record their reactions to the course that they have just finished instructing. As an instructor or staff member, you are in a position to judge the value and effectiveness of the course and materials. Please circle your response to each item on the questionnaire.

Strongly Disagree 1
Disagree 2
Undecided 3
Agree 4
Strongly Agree 5

1. The AN/TSQ-73 Console Operator course ranks high when compared to other courses that I have previously taught. 1 2 3 4 5

   Comment: _____

2. The "Student Interactive Training System," was an excellent method of presenting the practical exercises to students. 1 2 3 4 5

   Comment: _____

3. The students using the "Student Interactive Training System," were able to complete the practical exercises in a reasonable amount of time. 1 2 3 4 5

   Comment: _____

4. The students using the "Student Interactive Training System," developed a high level of ability in performing the AN/TSQ-73 Console Operations. 1 2 3 4 5

   Comment: _____

Strongly Disagree
Disagree
Undecided
Agree
Strongly Agree

5. The students using the "Student Interactive Training System," did not have any difficulty in paying attention to the practical exercise portion of the AN/TSQ-73 Console Operator course. 1 2 3 4 5

   Comment: _____

6. I look forward to working with future courses that will use the "Student Interactive Training System." 1 2 3 4 5

   Comment: _____

7. Students were able to use the "Student Interactive Training System" with little instructor assistance. 1 2 3 4 5

   Comment: _____

8. The training equipment used in the "Student Interactive Training System" had very few problems. 1 2 3 4 5

   Comment: _____

9. What did you like about the "Student Interactive Training System?"

   _____

   _____

   _____

   _____

10. What did you dislike about the "Student Interactive Training System?"

    _____

    _____

    _____

    _____

# APPENDIX F

# PROBLEM LOG FOR THE SITS TERMINALS

## PROBLEM LOG FOR SITS

COURSE: _____

SITS #: _____ DATE: _____

| Date | Time | Lesson/Task | Problem Classification | | Nature of Problem | Date/Time Repaired | |
|---|---|---|---|---|---|---|---|
| | | | Soft-ware | Hard-ware | | Date | Time |
| | | | | | | | |
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